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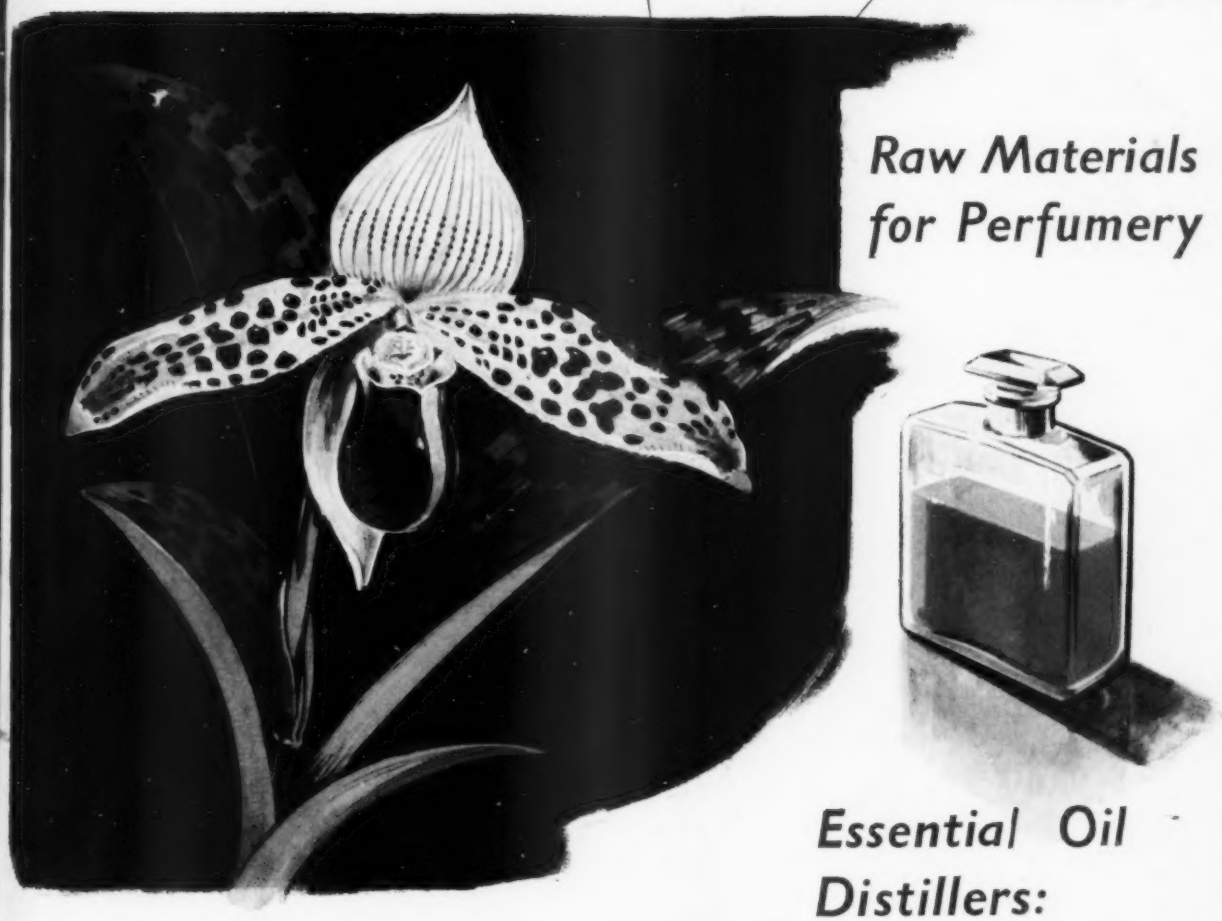

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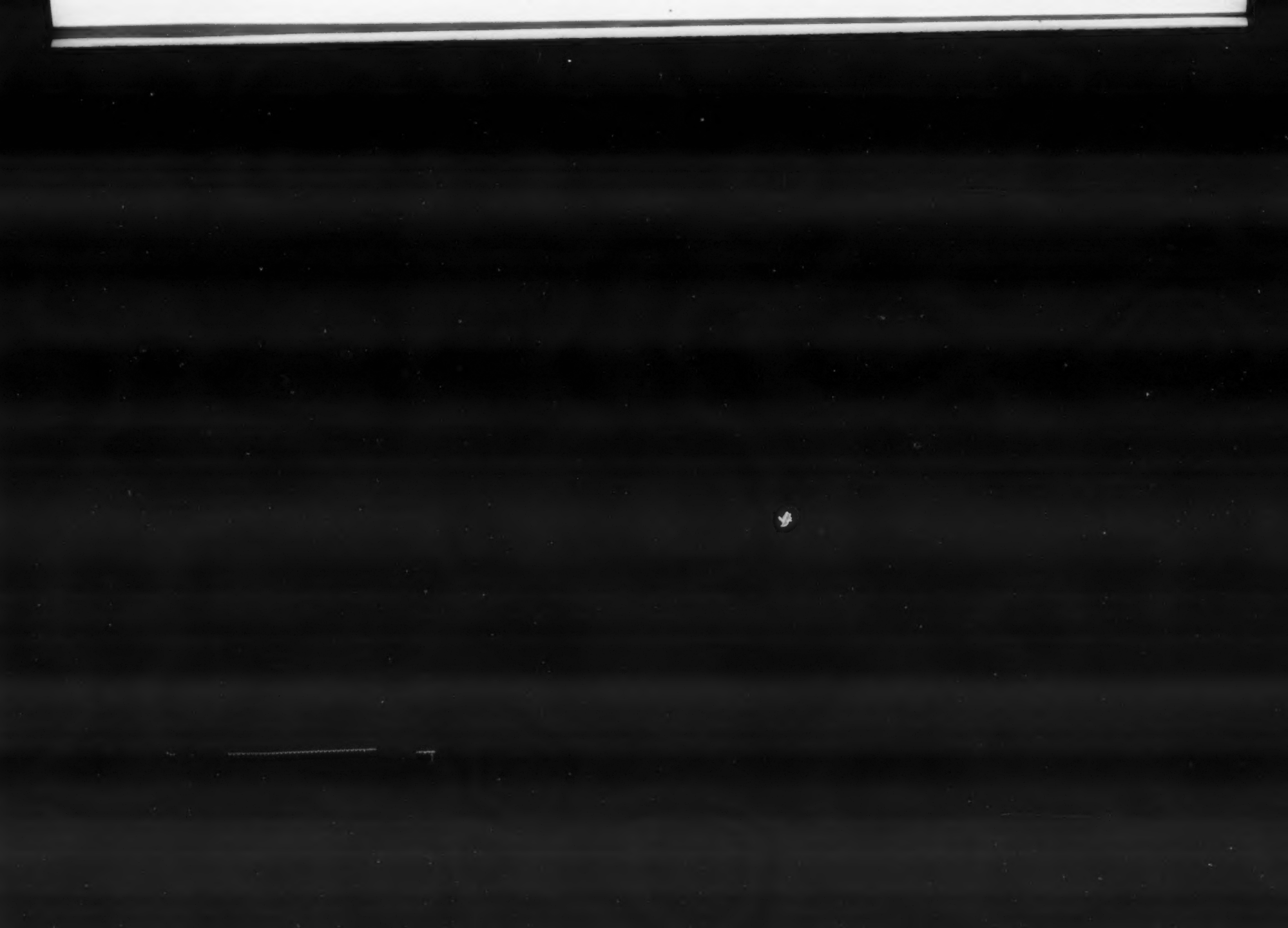

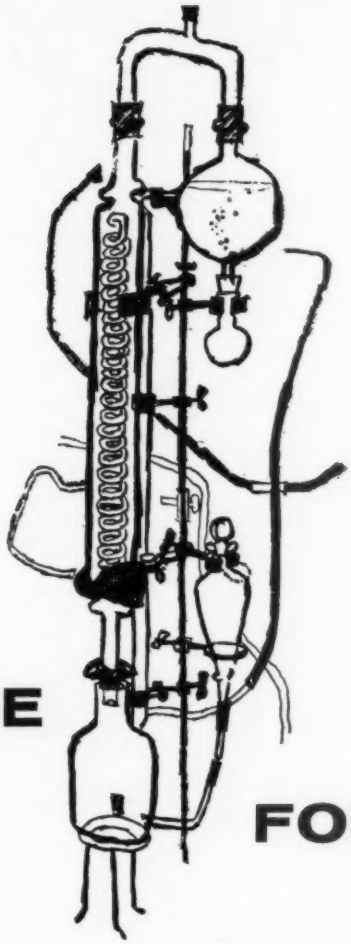

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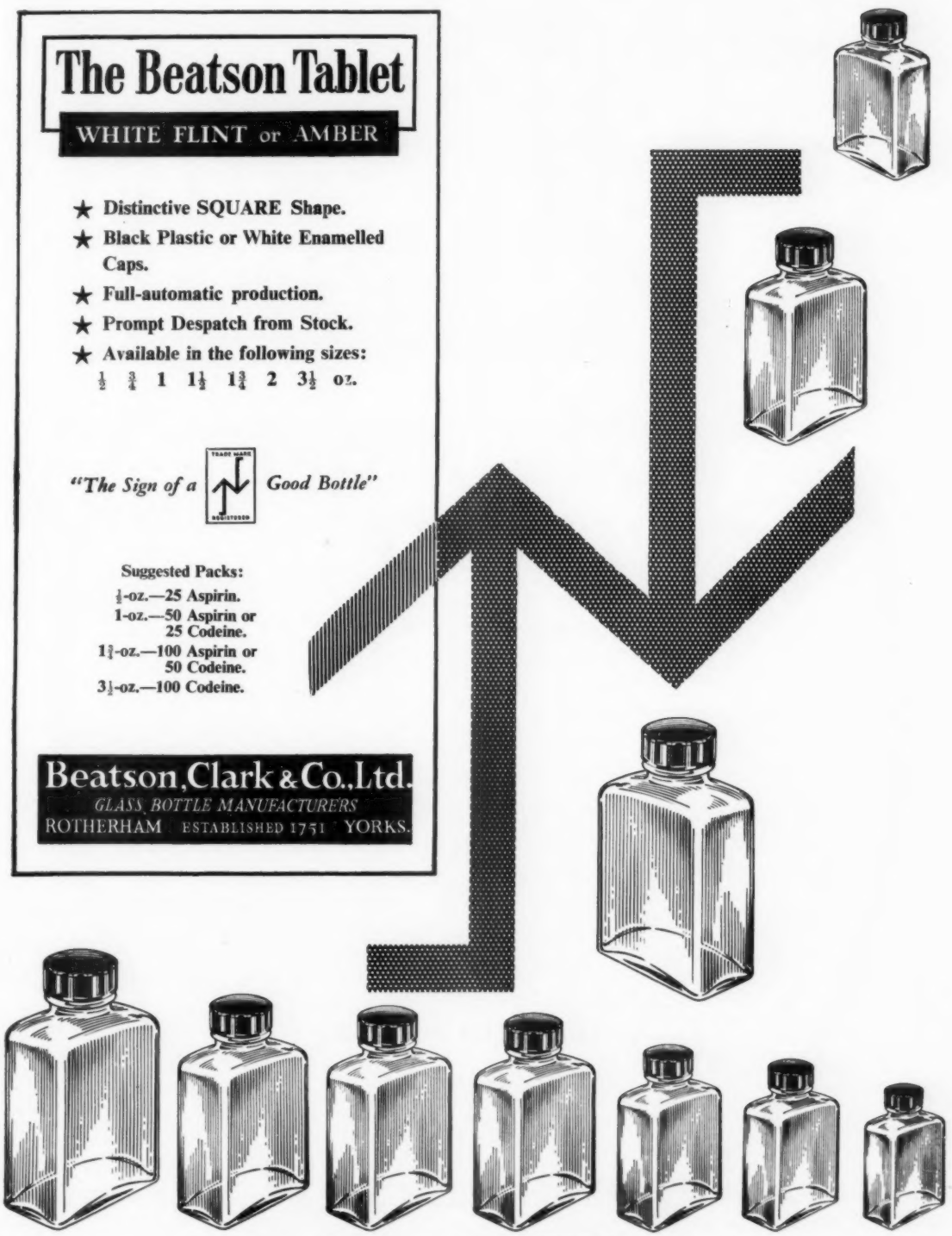

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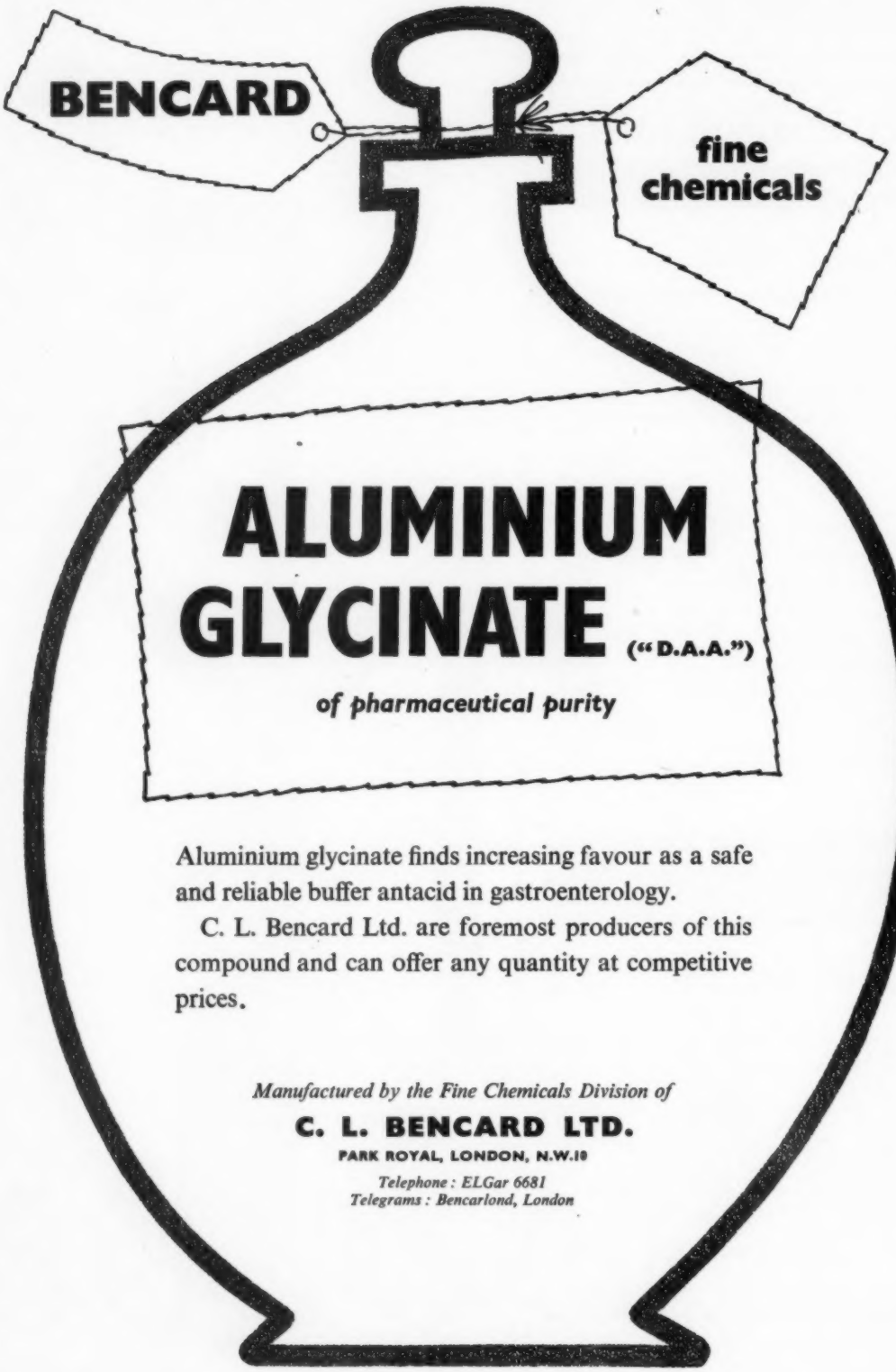

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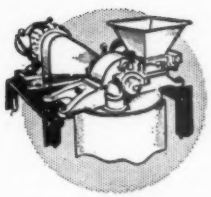

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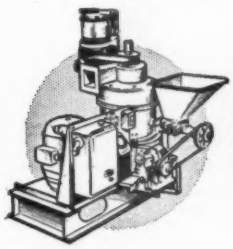

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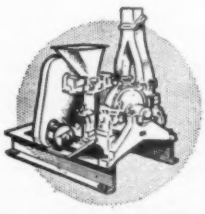

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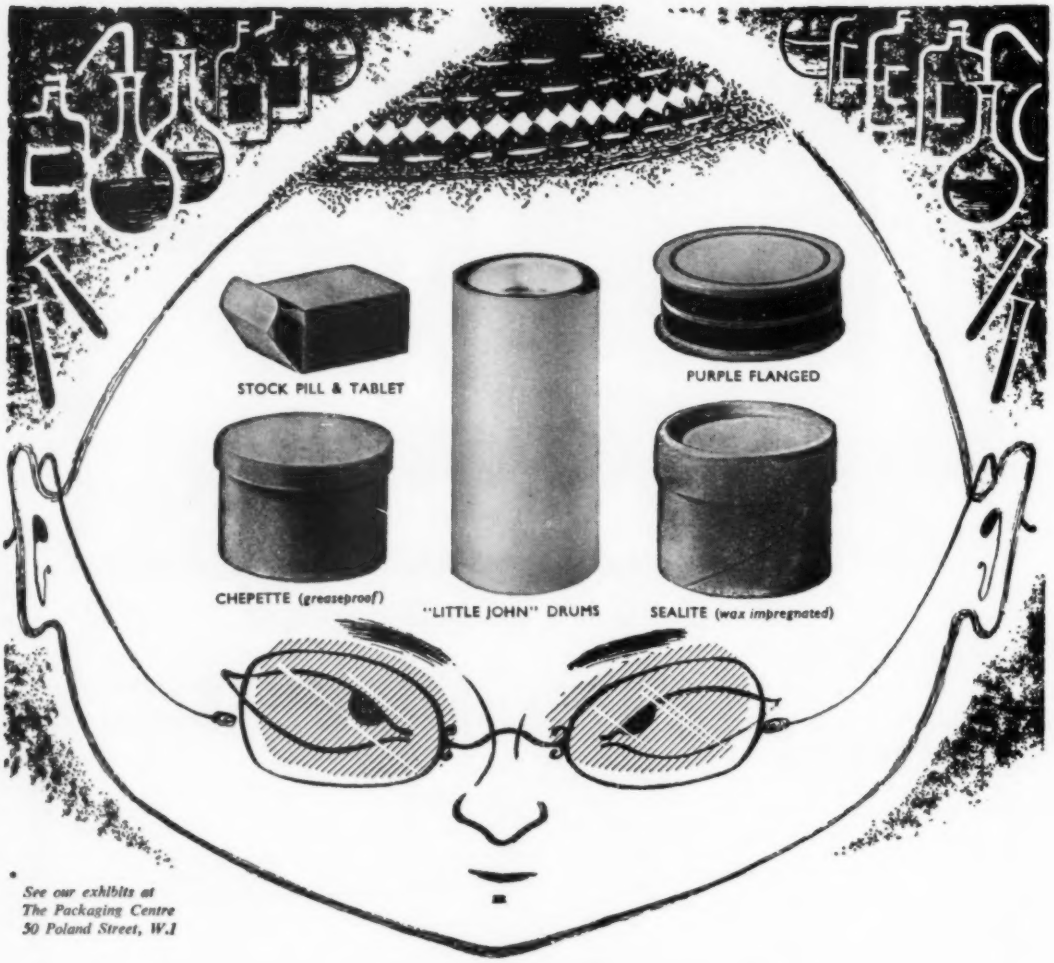

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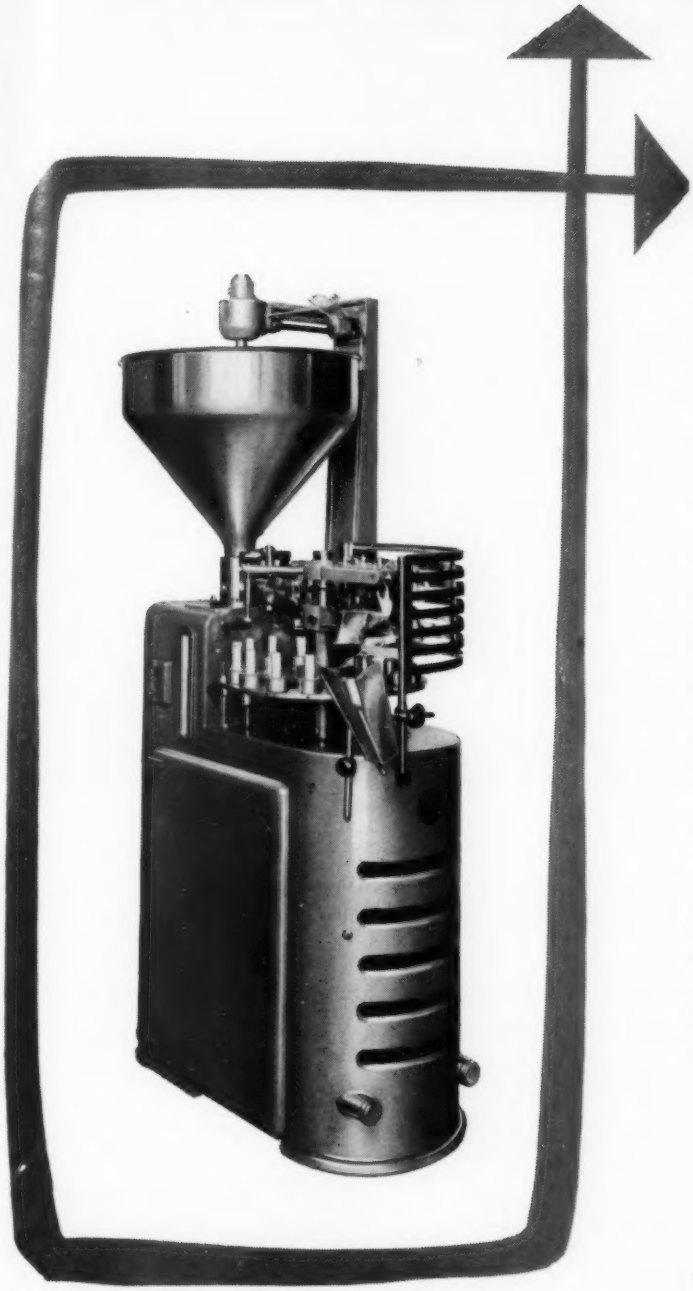

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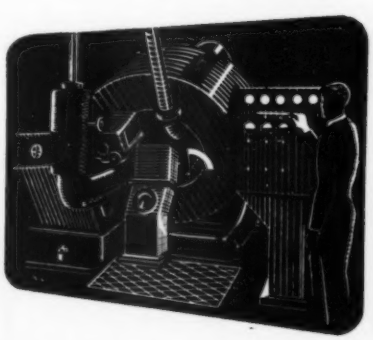

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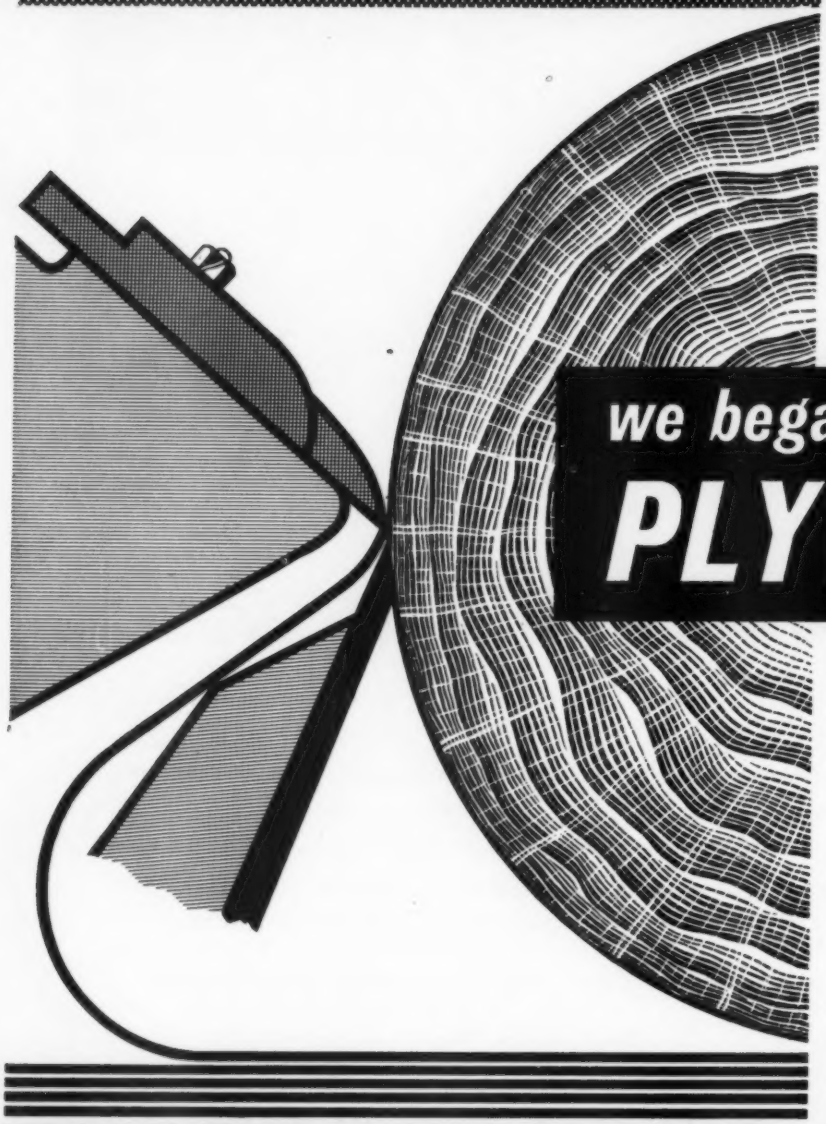

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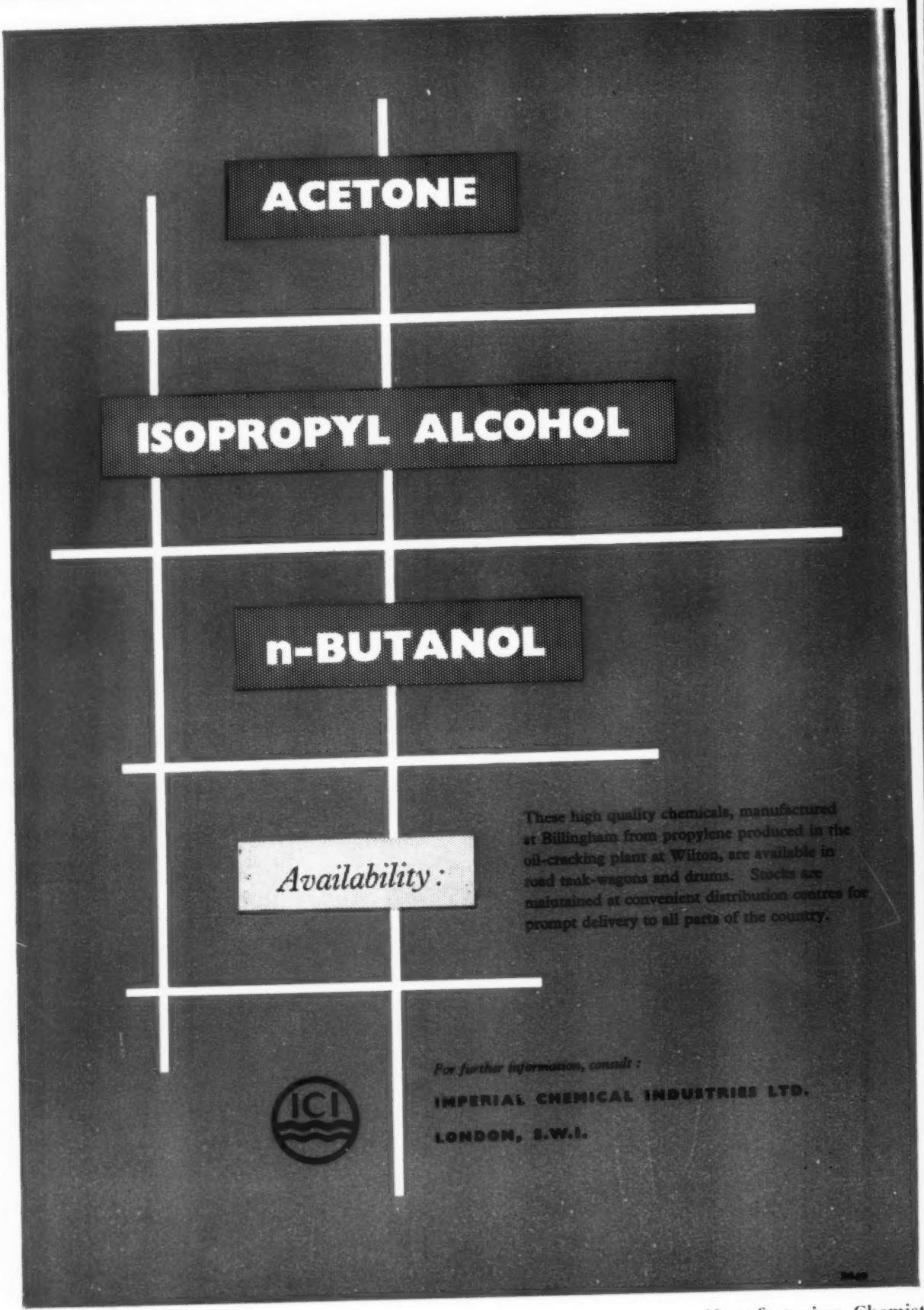
Samples and Literature on request.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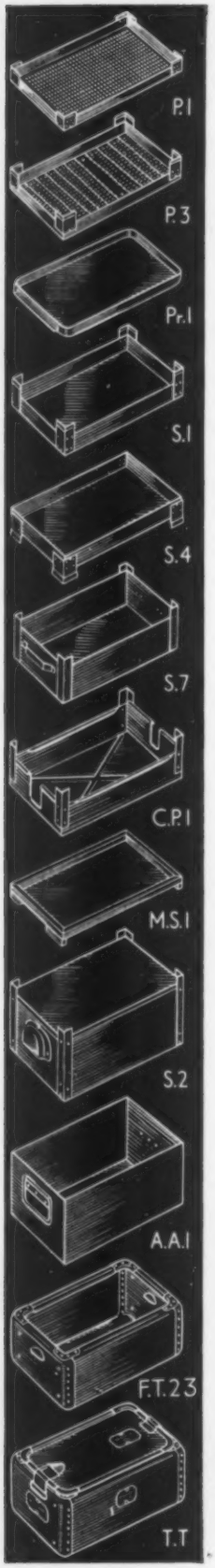

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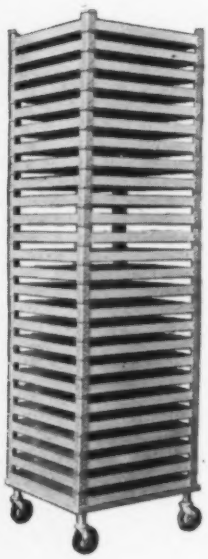

We illustrate on left the stacking principle which can be made mobile in conjunction with a "HESTALITE" Trolley.

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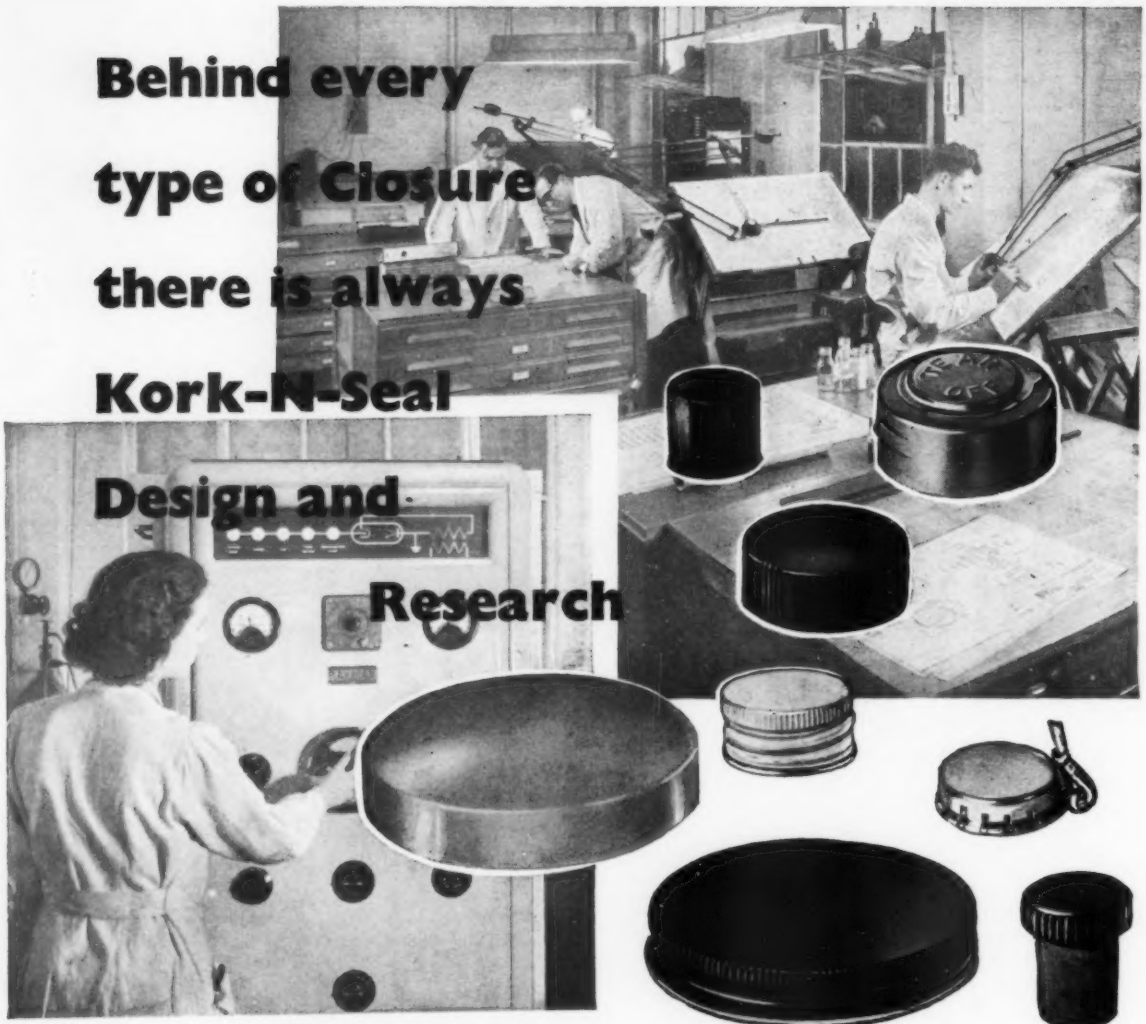

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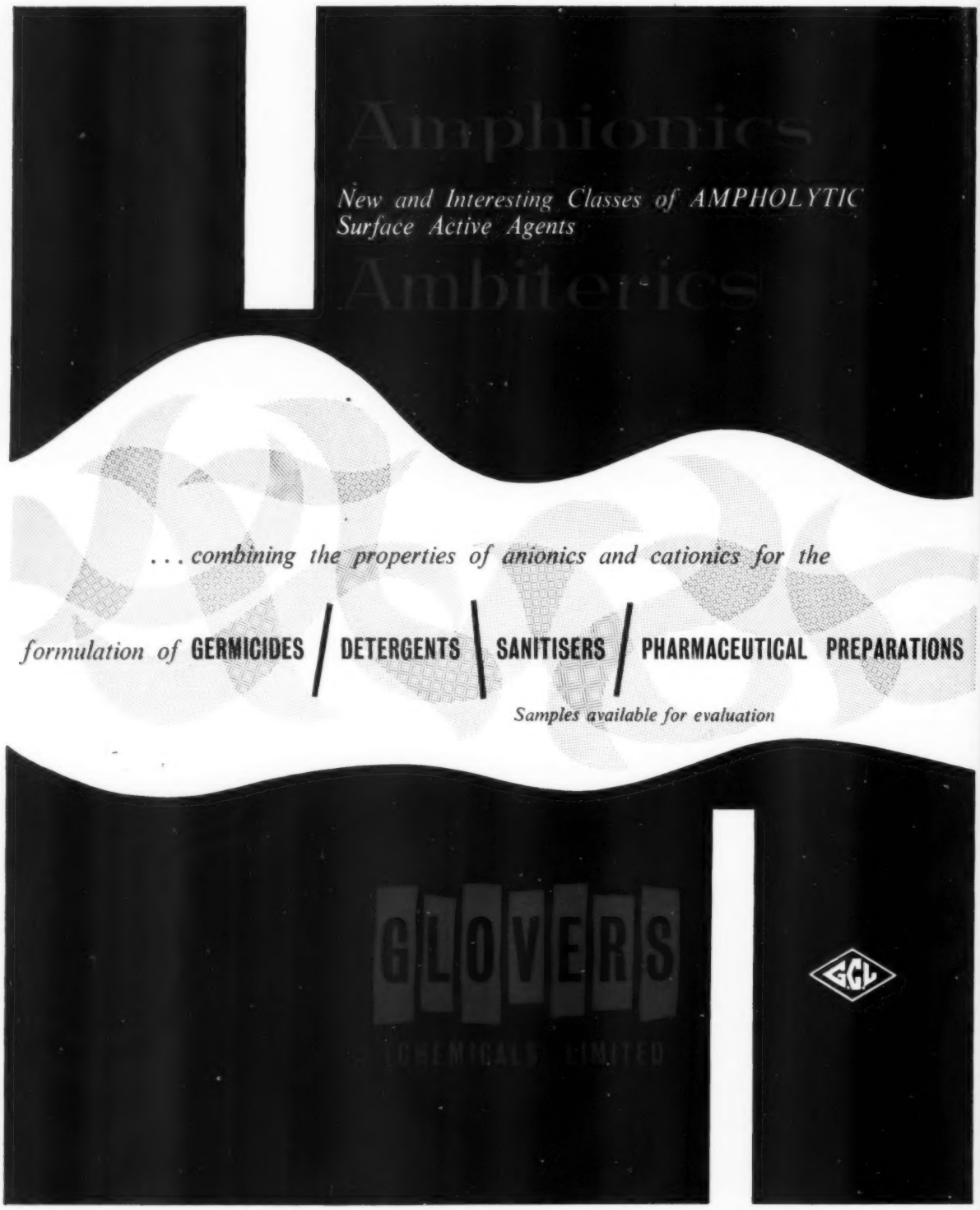
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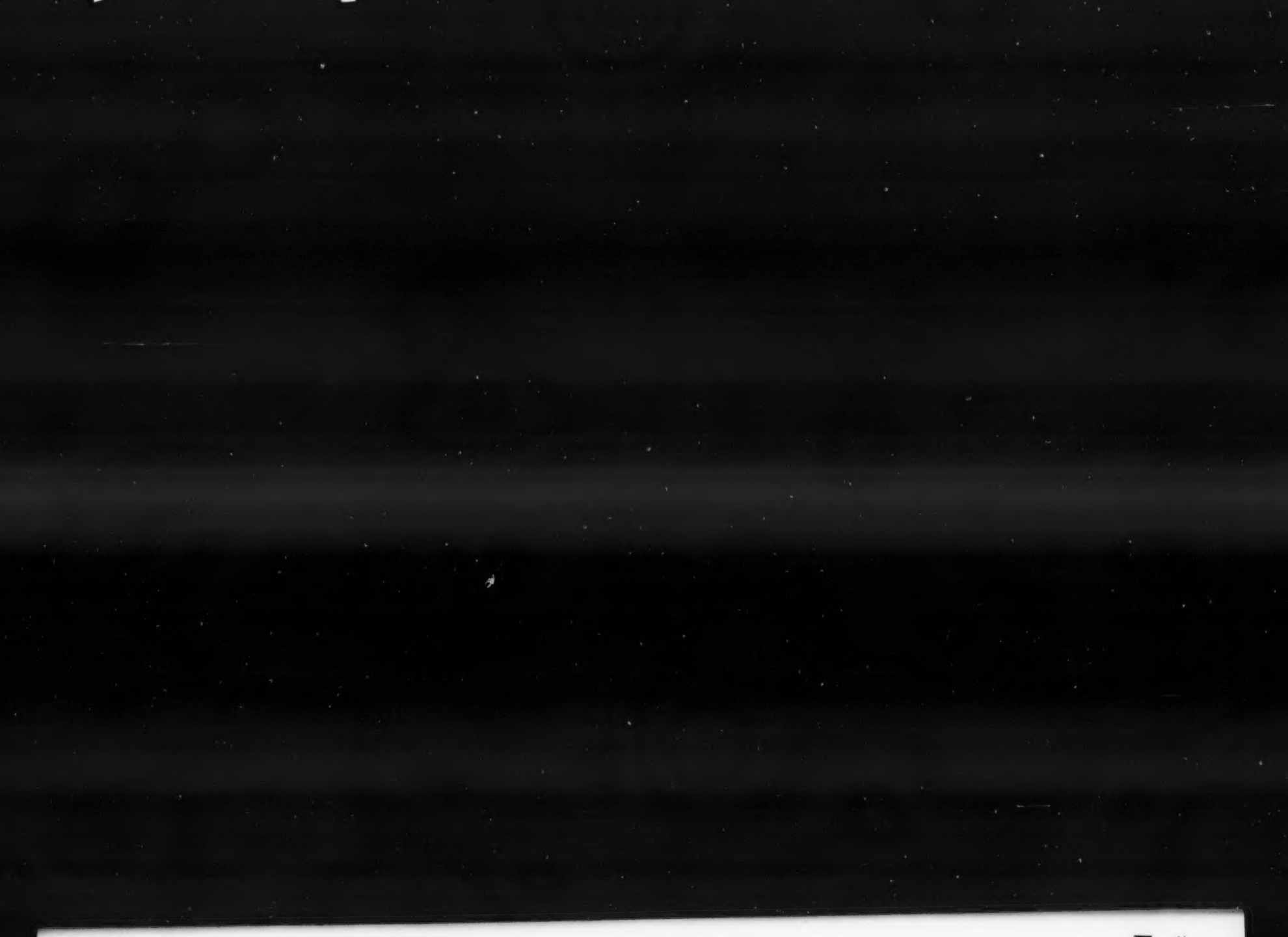

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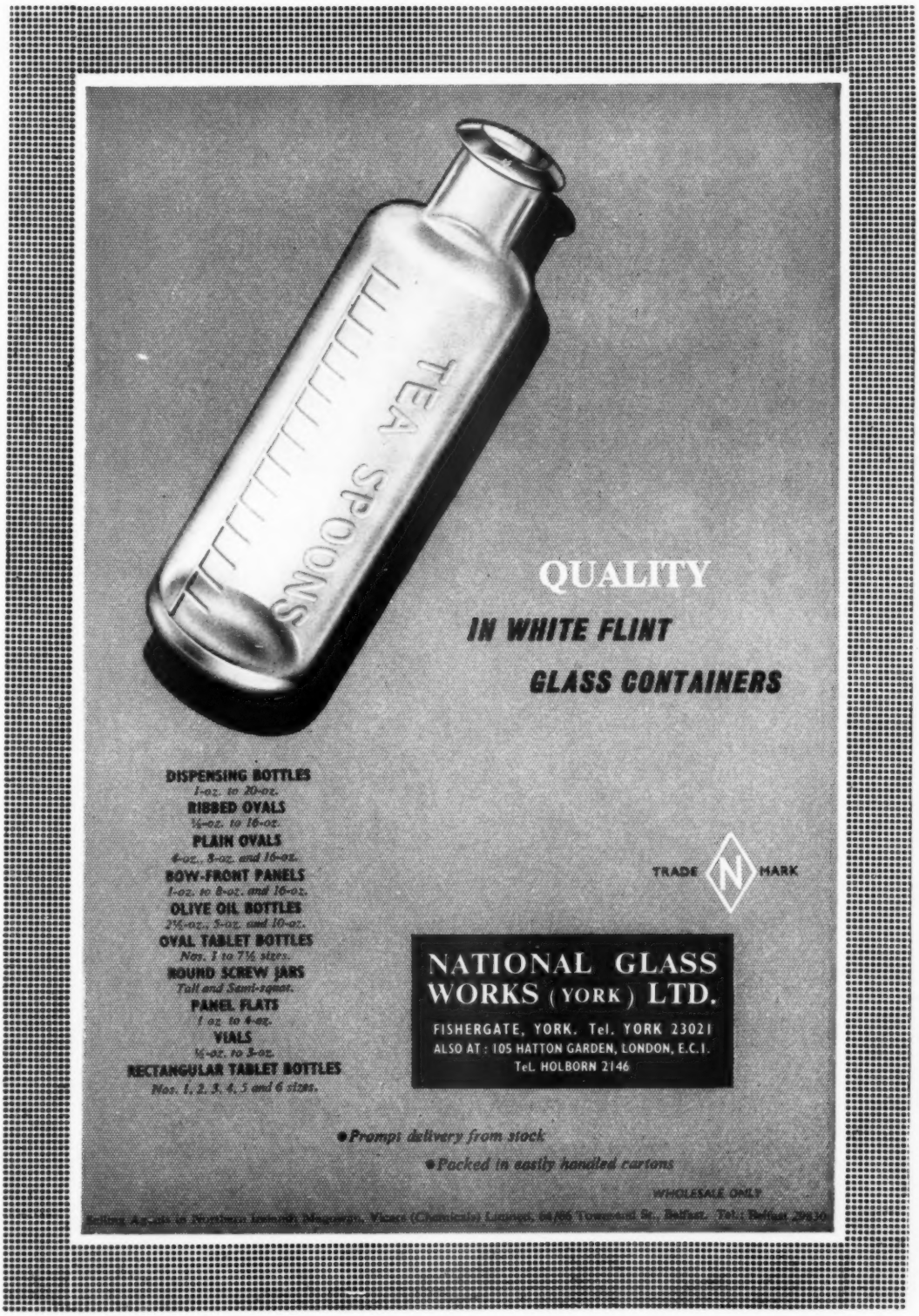
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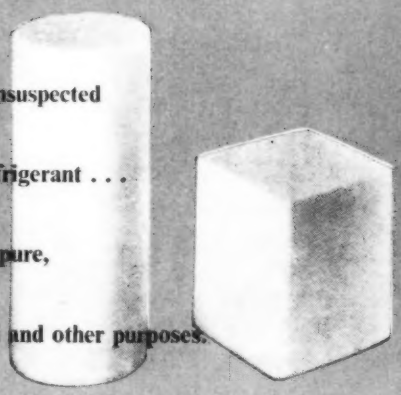

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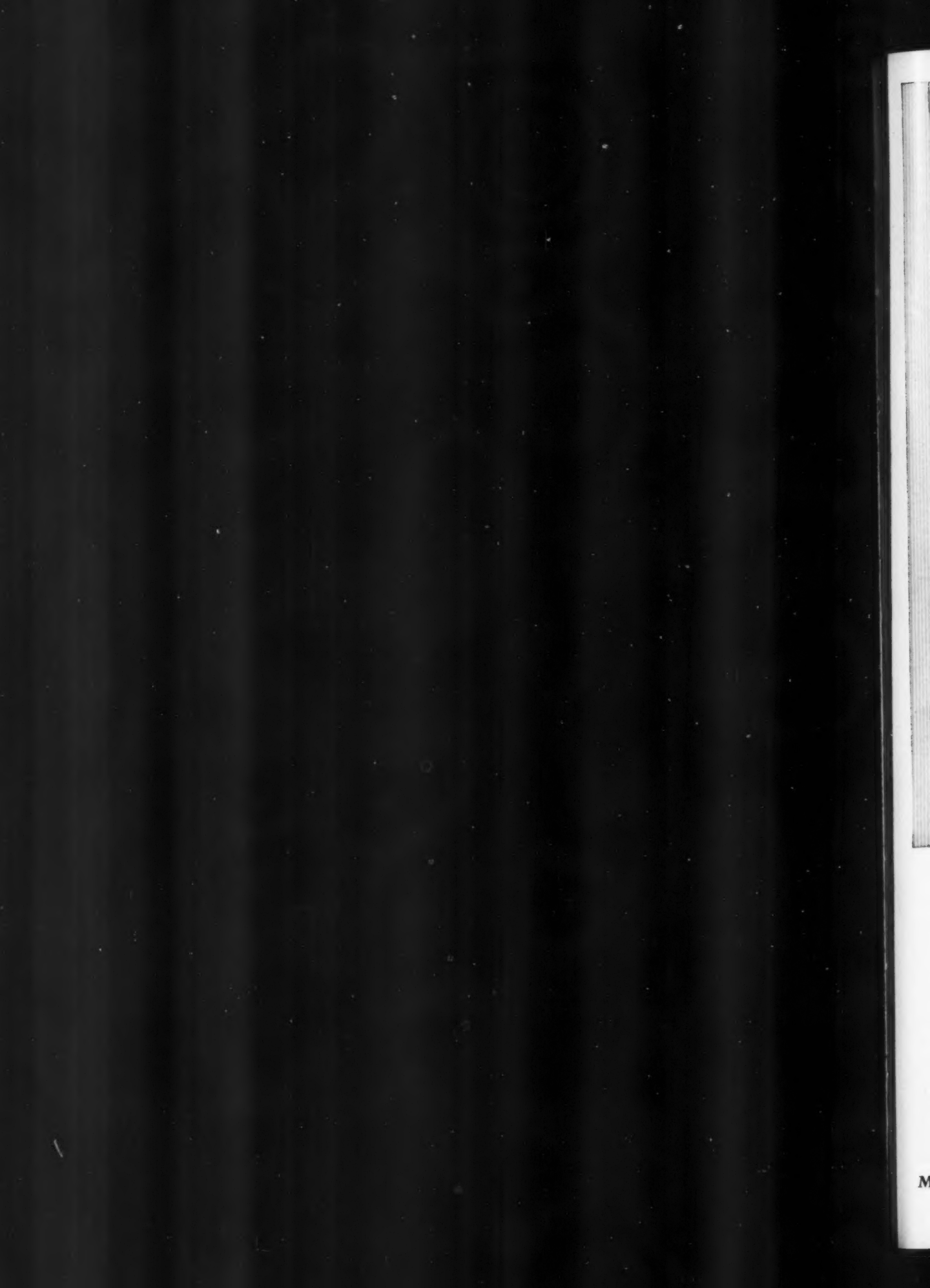

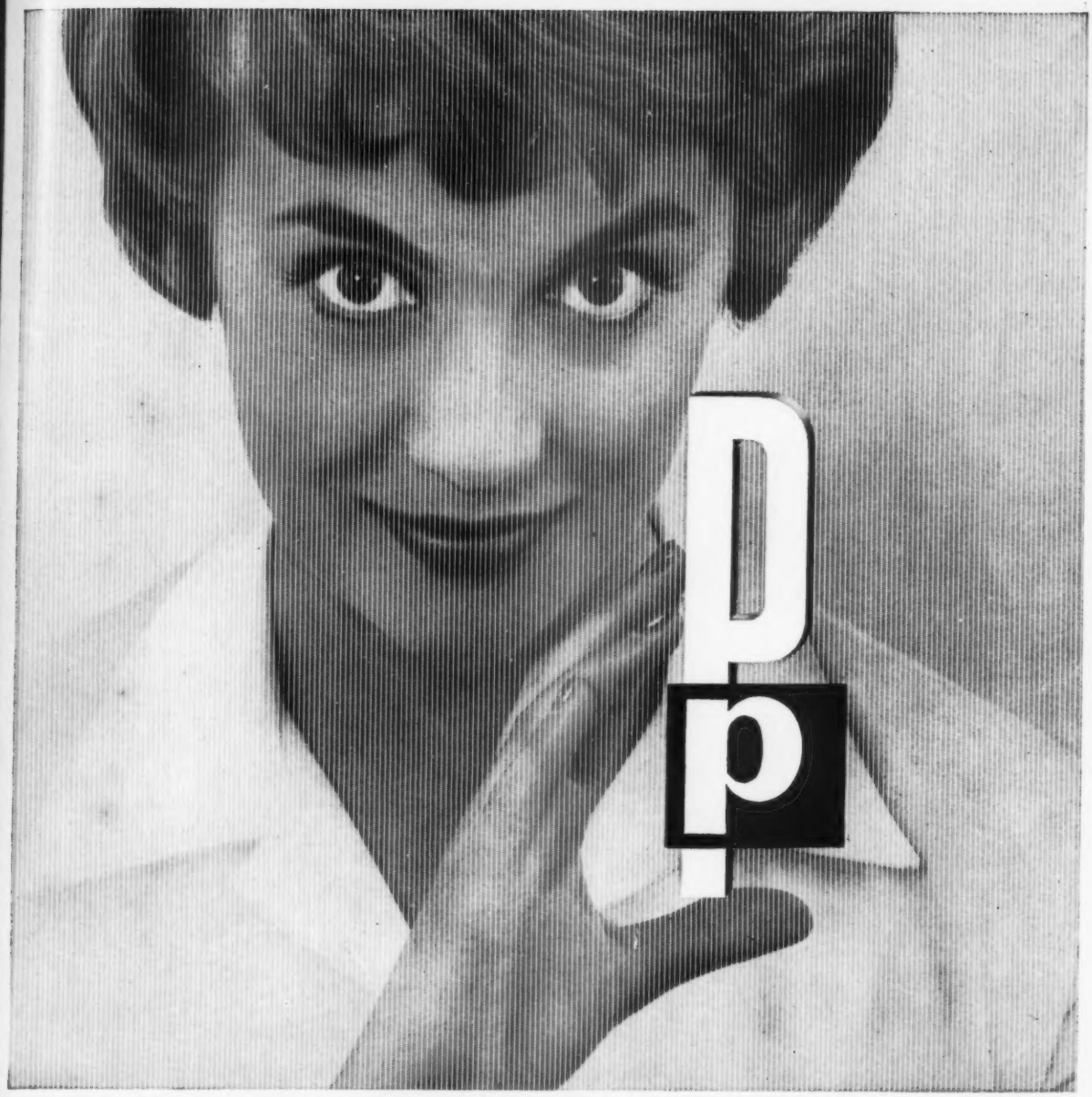

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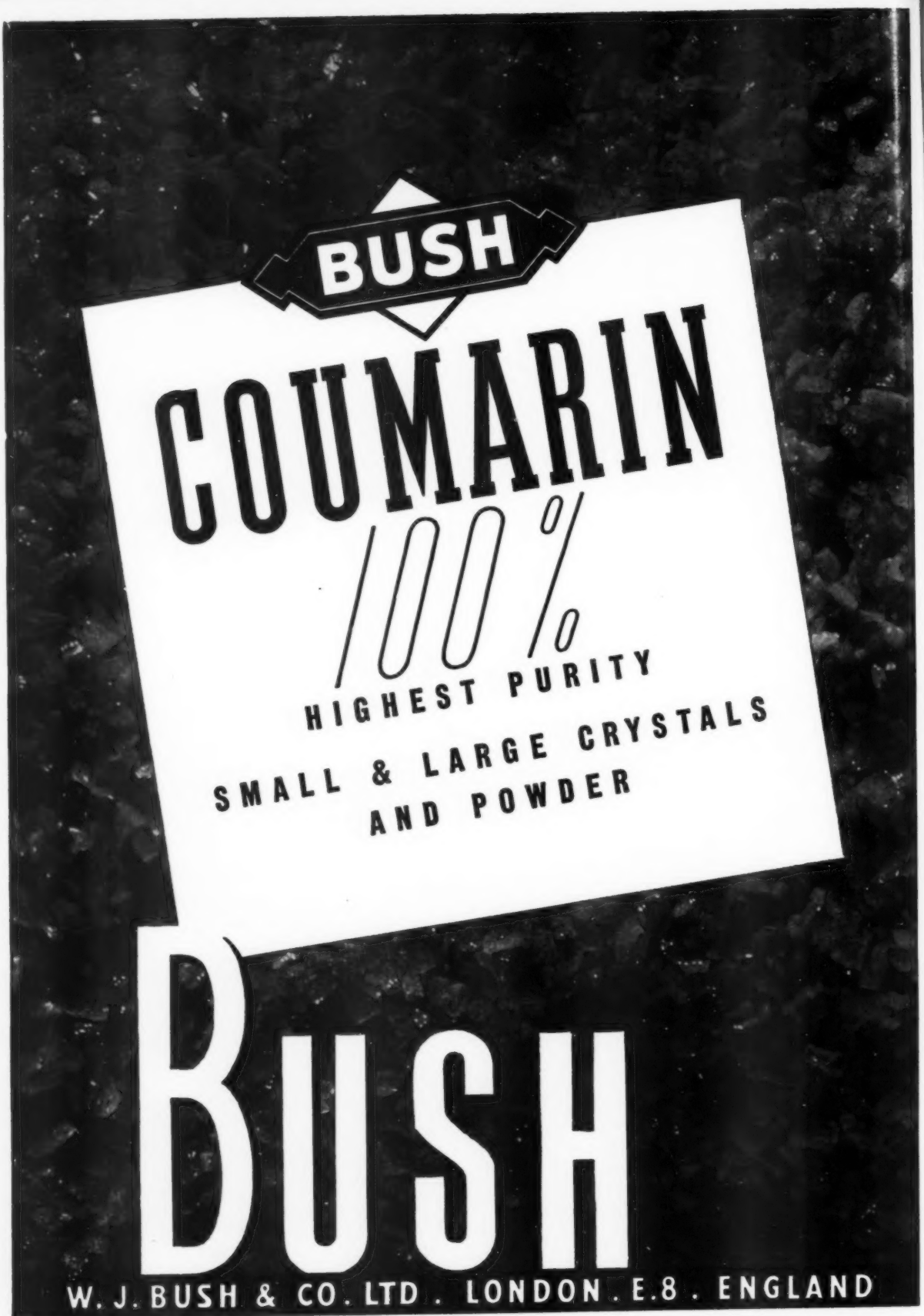
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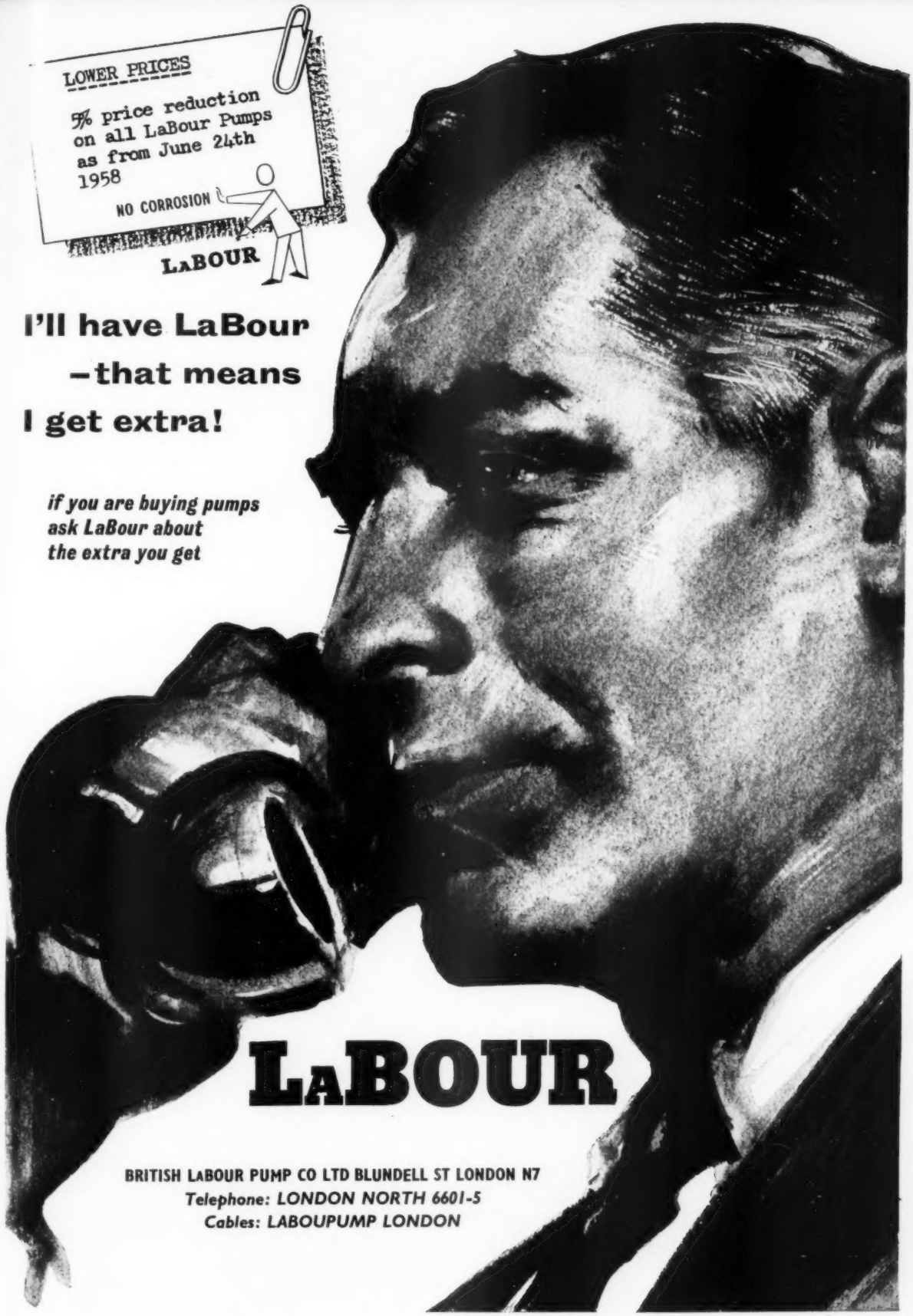
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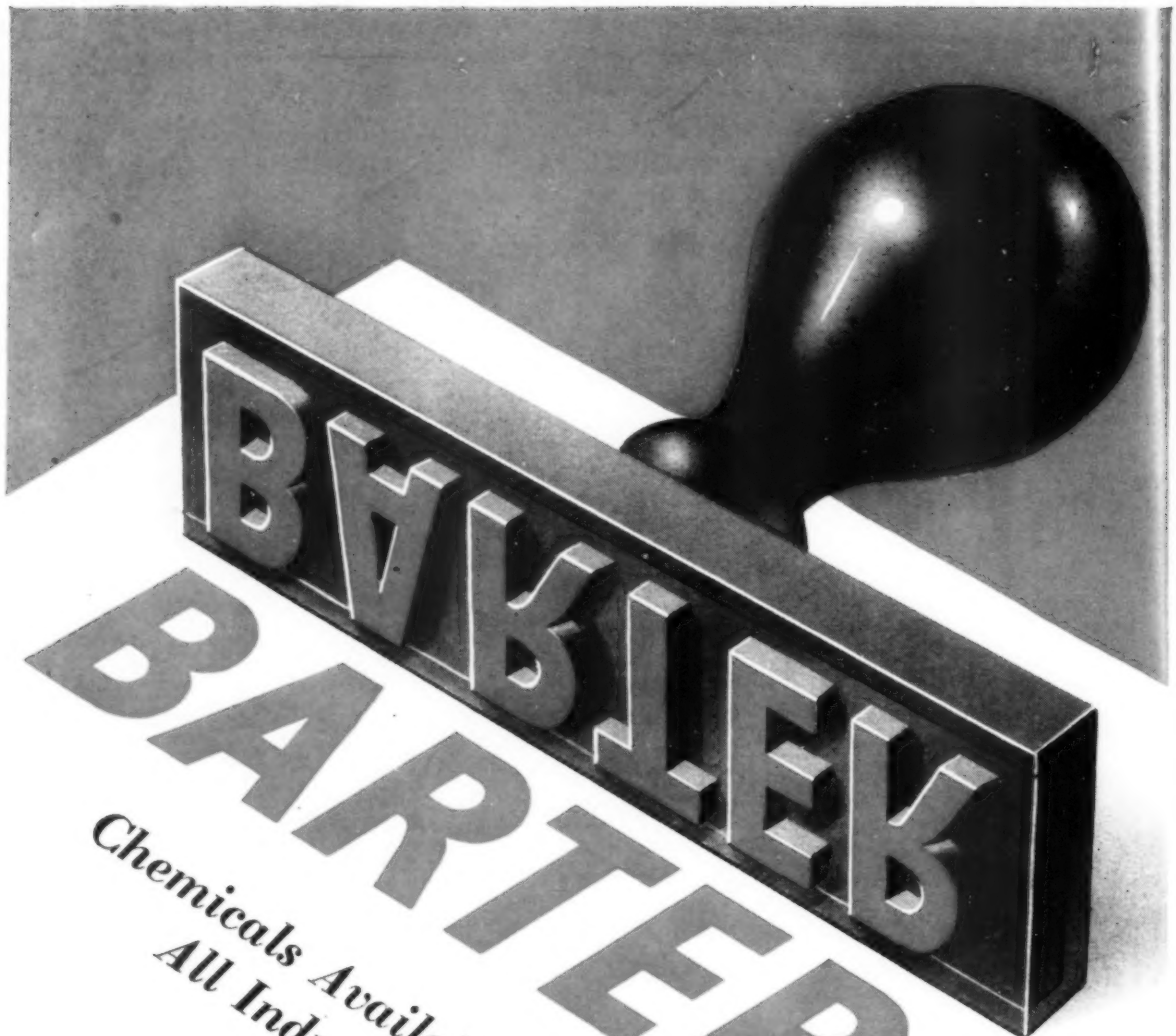

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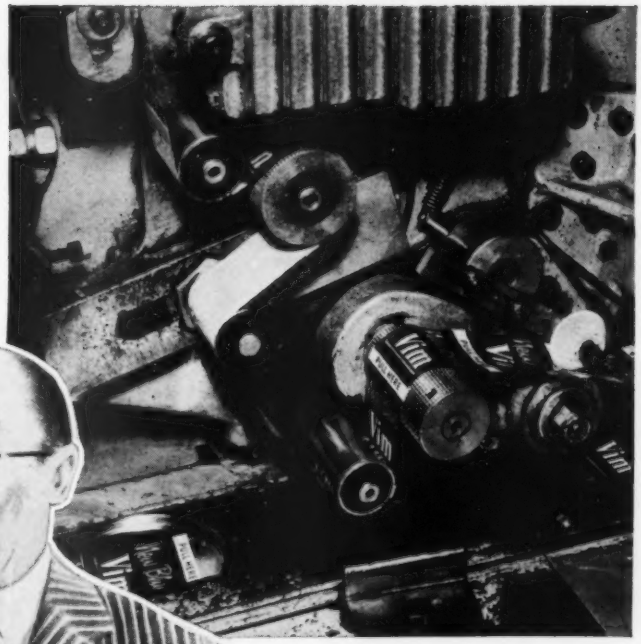

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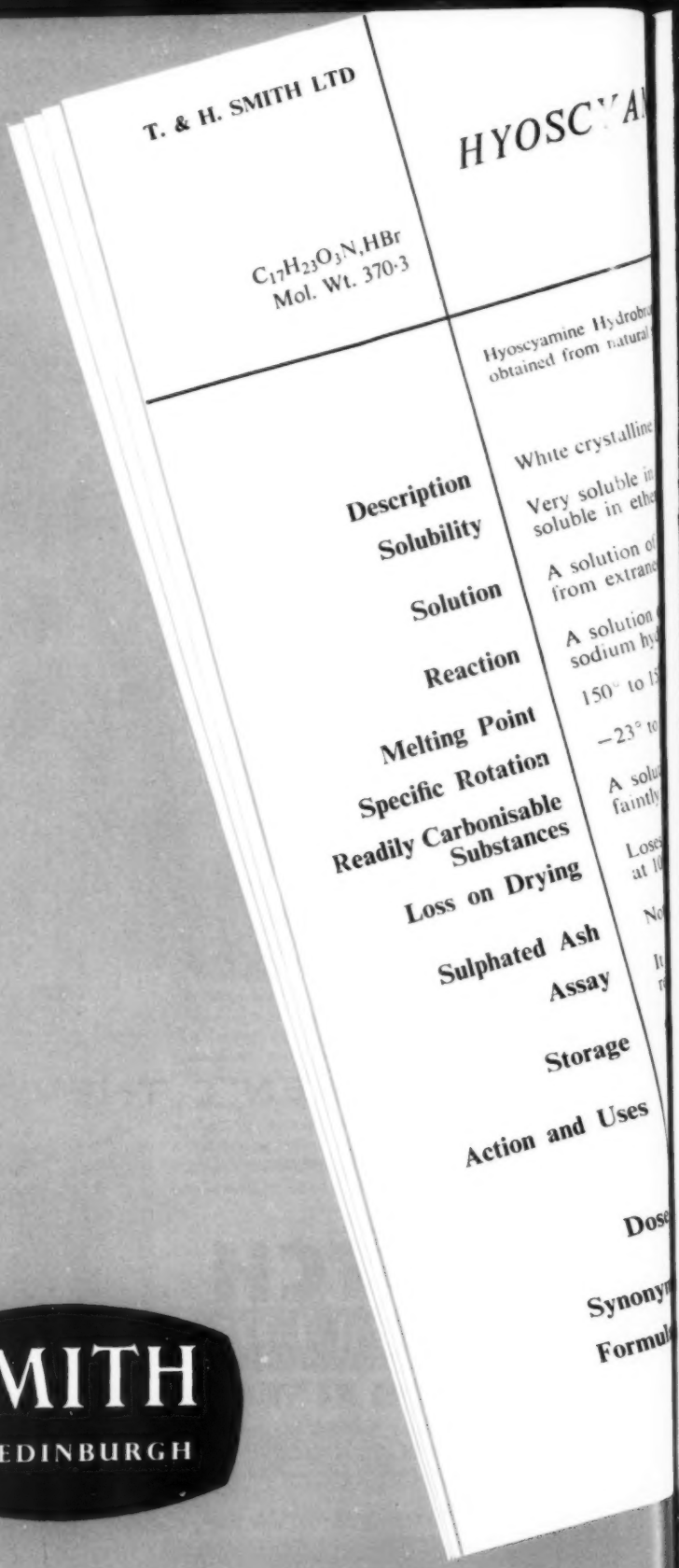

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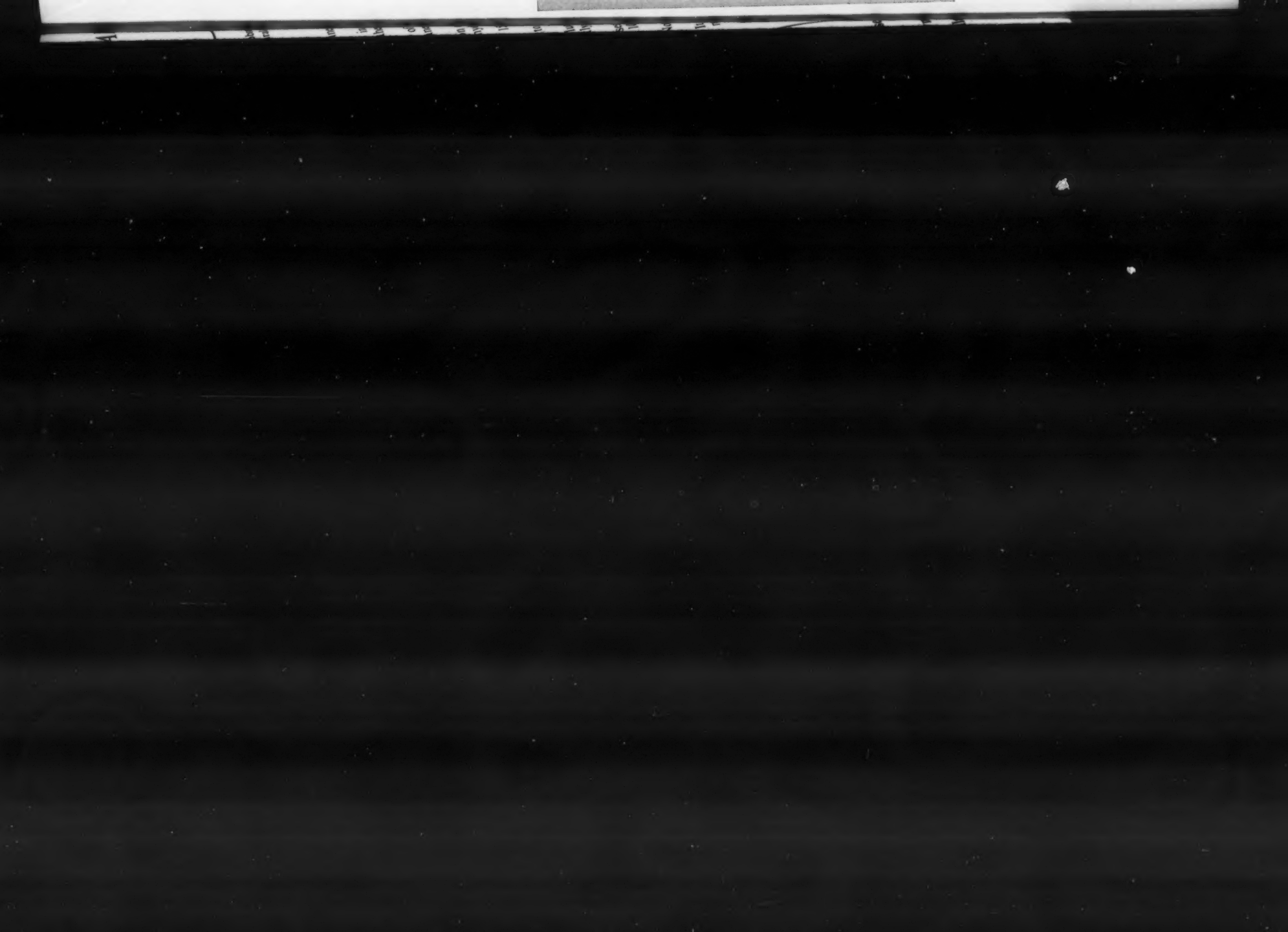

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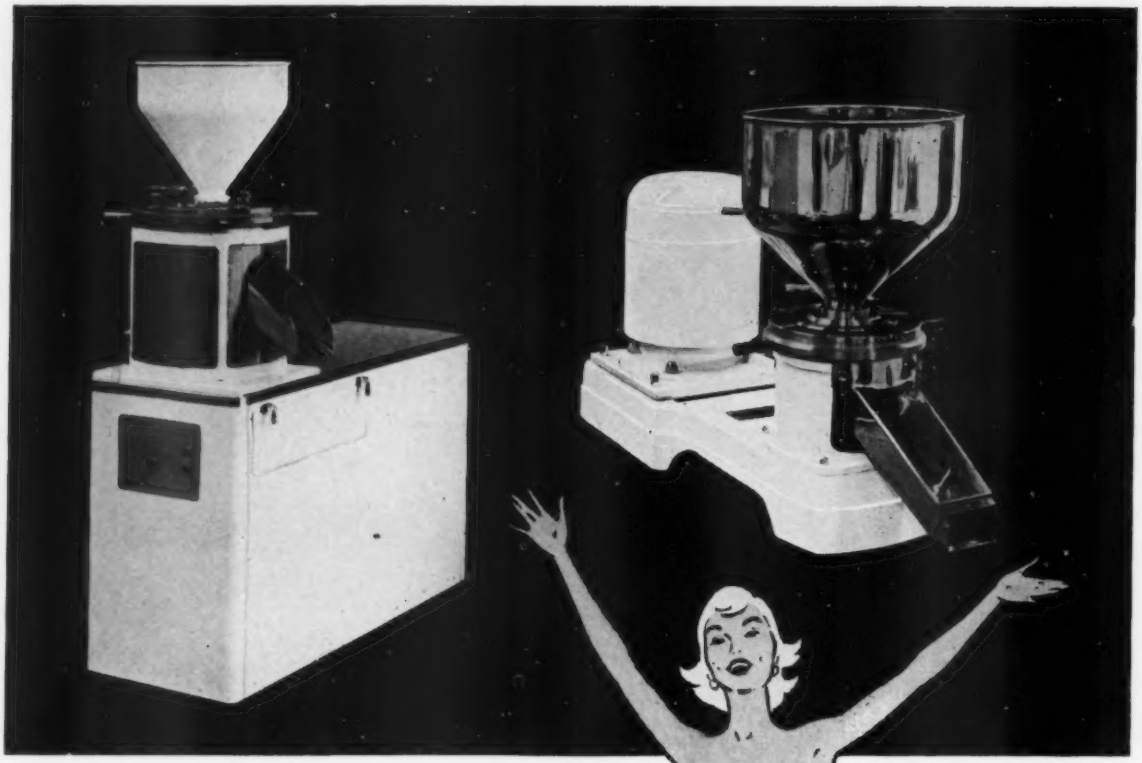

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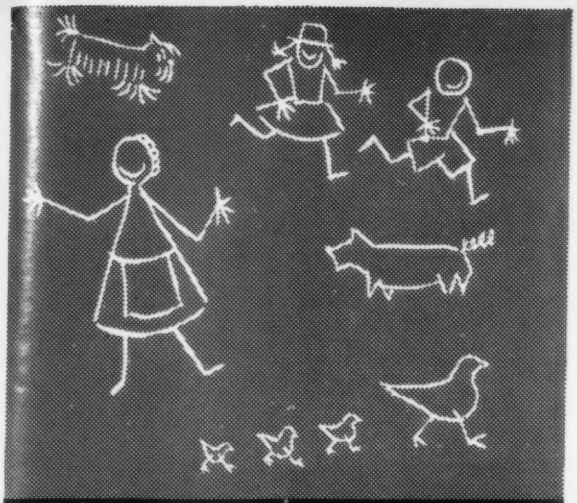

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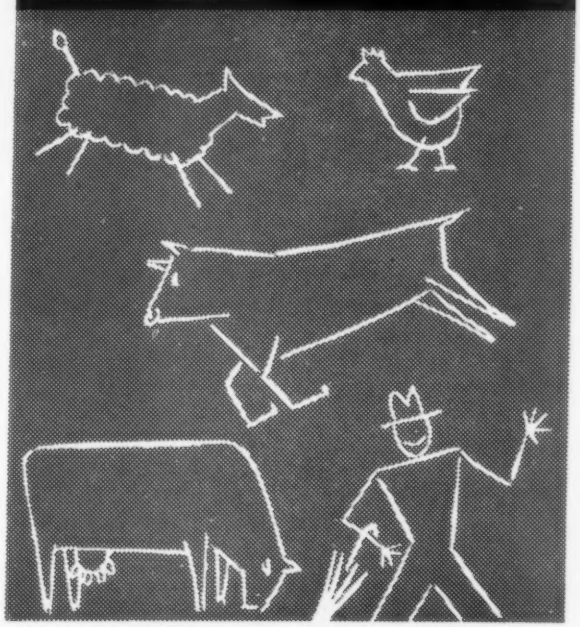

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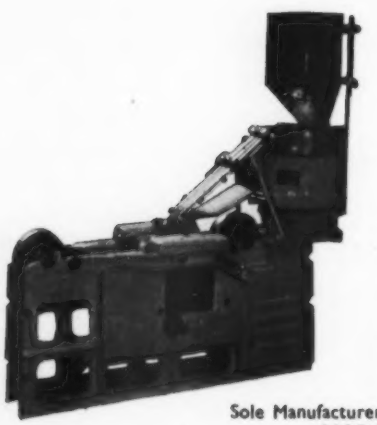

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Illustration above:—
Birlec adsorbers for hydrogen drying.

Illustration right:—
Electrolytic hydrogen plant at Murex Limited.

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MANUFACTURING CHEMIST
and Manufacturing Perfumer

Vol. XXIX, No. 8 — AUGUST, 1958

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TOPICS AND COMMENTS

Advertising in a technological age

ADVERTISING irritates and stimulates, it is vulgar and dignified, it is trivial and informative. It is the most public act a firm can indulge in. It provokes controversy and argument. That is right and proper. Usually, however, the people who argue about advertising are not the people who buy it—at least not directly. So it was refreshing and interesting to read Lord Heyworth's lucid and sober evaluation of advertising given at the annual meeting of Unilever.

Unilever spent £83 million on advertising last year. That is a staggering sum, even when spread over 200 companies and 1,800 million customers. Why do Unilever spend so much? Why do they not use it to reduce prices? These are straight questions, deserving straight answers. Probably the best answer is Unilever itself. From a small company making and selling *Sunlight* soap it has grown to a mighty empire which last year had a turnover of £1,720 million, nearly £50 million more than the previous year. Who could conceive of this being achieved without advertising?

What of the second question: why not cut prices instead? This is Lord Heyworth's answer: "Advertising is certainly one of the costs of a product, but it is a cost which brings savings in its wake. On the distribution side it speeds up the turnover of stock and thus makes lower retail margins possible, without reducing the shopkeeper's income." This is the textbook answer. Unilever have proved it in practice.

Lord Heyworth affirms that among the instruments necessary to turn a country's potential into usable consumer resources advertising plays a leading part. "It would indeed be a sorry thing if in this time of increasing scientific change and development advertising were to be forbidden to play its part in translating the fertile thoughts of scientists into results that mean something in everyday life." It is another way of saying that no invention is a scrap of practical use until it is applied. Advertising is a vital instrument in applying it.

If these arguments are true of consumer advertising they are *a fortiori* true of the advertising which serves chemists, engineers and technologists of all kinds. Unilever use television to sell margarine and soap, but no one in his senses would use it to sell chromatographs or isobutyl alcohol or centrifugal separators. Neither would they use newspapers, or should not if they have the slightest idea of the selectivity it is possible to achieve through the intelligent use of the specialised technical press. The British technical press flourishes in such richness and variety that with a little effort it is possible to find a satisfactory medium for any product, no matter how specialised and rare. Not only are the right journals the most effective media for this advertising, but they are also generally more economical than any other method of advertising. Anyone who doubts this should add up the costs of printing and posting, say, a direct mail shot and compare it with technical journal advertising rates.

Just as it is absurd to use a mass medium for specialized advertising so it is fallacious to apply in this context the criterion of circulation in the way it is applied to newspapers and television. What is the point of demanding a circulation of 20,000 when there are only 1,000 customers anyway? So long as a journal is read and supported by the majority of the readers it sets out to serve it is, self-evidently, influential and worth while.

It is equally wrong to apply the techniques of the mass market to specialised advertising. Technical people are usually unmoved by slogans. Like the man from Missouri, they want to be shown. They want sober information, facts and more facts. The advertising pages of a technical journal should be just as informative in their way as editorial pages. The technical press provides industrial scientists with a service as important as the tools of their trade. It is not designed or produced as entertainment but as information. Those who buy advertising in the technical press should remember this and fashion their appeal accordingly.

Microbes at work

AN interesting summary of the organisation and scope of transatlantic work on economic microbiology is given in a recent addition to the series of Overseas Technical Reports issued by the D.S.I.R. entitled "Industrial and Economic Microbiology in North America" (2s. 6d. net, 37 pp.).

This report was compiled by a member of the staff of the Chemical Research Laboratory, Teddington, who in 1956-57 visited a large number of American and Canadian research institutes, especially those wholly or in part Government sponsored. Attention is confined to certain sections of the subject—omitting work on foodstuffs, and on soil and medical microbiology.

Fermentation work in America is largely financed by industry, and hence not all is published. The Northern Regional Research Laboratory in U.S., and the Prairie Regional Laboratory in Canada are the main official bodies which carry out such work, *e.g.* on the production of certain organic acids, antibiotics and vitamins. For the production of organic solvents, synthetic methods are replacing fermentations. On the other hand, the production of the vitamins riboflavin and B_{12} (cobalamin) is now almost entirely by fermentation methods.

The microbial production of enzyme preparations continues to increase in importance. Other possi-

bilities under investigation are the cultivation of algæ and of *Azotobacter* with a view to increasing food supplies, and the fortification of cereals with amino-acids (notably lysine) by bacterial means.

The important problem of the deterioration of materials receives more Government attention in U.S.A. than in this country. A large proportion of such deterioration is due to micro-organisms and official research, *e.g.* at the Prevention of Deterioration Centre, is concerned with the protection of equipment for the armed forces.

Disposal and utilisation of industrial wastes also receives much attention—mainly in the States, though Canada successfully runs a process for the conversion of sulphite waste liquor to alcohol.

Among minor bacterial processes being tried out it is interesting to note the use of sulphate-reducing bacteria to liberate petroleum from oil-bearing sand, and that of sulphur *oxidising* bacteria for freeing metals (as soluble sulphates) from their ores.

A remark made in the introduction to the effect that some workers employed in economic and industrial microbiology in North America ". . . may never have taken a formal course in microbiology" applies, we fear, with equal force to this country.

Tracers aid pharmacology

THE CHEMICAL and pharmaceutical industries are among the best customers for radio-chemicals which are being increasingly used for tracer studies of weedkillers, pesticides, detergents and fertilisers. The use of labelled drugs for determining their mode of action and metabolic fate, and of special compounds as diagnostic aids, is also mounting. These are some of the reasons why the Radiochemical Centre at Amersham has increased the value of its output of radio-chemicals by 400% in four years—from £100,000 in 1954 to over £400,000 p.a. today. Some 70% of these compounds are exported.

An example of an experiment that produced results which could never have been obtained by any other method is the recent use of tracers to determine the effectiveness of a vaporising ointment made by the Vick Chemical Co. under the name VapoRub. They wanted to find out how fast the vapours of the mixture of aromatic oils in the ointment reached the lungs and how long an external application continued to give off vapours. The experiment was undertaken by the Nuclear Science and Engineering Corporation. For technical reasons tritium (hydrogen-3) was used to label camphor and menthol, two of the aromatics contained in the formulation. A fresh mixture of ointment containing the labelled aromatics was administered to dogs which had plastic tubes inserted into the bronchial passages through chest incisions.

Each dog was anaesthetised and a breathing apparatus fitted over its mouth and nose. Samples of each breath of air inhaled by the dog were collected, and their tritium content assayed with a low-level radioactivity counter. It was shown that the VapoRub was inhaled as early as the second respiration after exposure.

In the second phase of the tests, dogs breathed vapours from VapoRub smeared on shaved areas of the body. Another sample was tested without the use of dogs, the vapour being collected from a quantity of the product spread in an open dish. The results were the same in both cases. It was proved that the medicating vapours were still being evolved several hours after application.

Skin on the air

FEW radio programmes have contained such a high-pressure blend of comedy, tragedy, drama, mystery and pantomime as that entitled "The Skin and the Cosmetic Industry" broadcast last month in the B.B.C.'s Home Service. The programme, arranged by Nesta Pain, opened with a sketch in which a woman of uncertain age was being subjected to a barrage of salesmanship by a lady beauty specialist who was patently out for big money with no holds barred. Her advice was sprinkled with such terms as "Out of this world," "Uplift Lotion," "Petal Cleansing Cream," "Caviar Cream" and tit-bits of scientific jargon such as "the *p*H balance of the skin."

The story could not reasonably be expected to persuade any mortal with normal mental processes to part with the suggested £3 17s. 6d. for a small jar or £7 0s. 3d. for the full size.

These preliminaries provided the basis for a discussion between a number of experts, including two skin specialists, a psychiatrist, a physicist and a zoologist . . . all played by radio artistes with appropriate distinguishing accents. These deliberations ranged over a number of subjects, including the sex display of the male pheasant and stickleback, baldness in men as a sex characteristic influenced by family tendencies, the effect of sex hormones in cosmetic creams and the comparison of female beauty in the time of the first Elizabeth and the present time. Included were rather alarming but somewhat irrelevant comments on hormone creams.

Although this programme was claimed to be a revision of a shorter broadcast made some years ago and brought into line with recent research by the cosmetic industry, recently published research on the effect of externally applied amino acids on hair growth was ignored.

The psychiatrist's comments were melodramatic. We heard the harrowing wailings and ramblings of patients being examined to find the causes of eczema, skin ulcers, and the sudden appearances of deep weals on the arm. The latter patient was a jockey who, surprisingly, quoted Omar Khayyám. His, and the other patients' troubles were successfully traced to mental disturbances.

Generally the programme was too artificial and theatrical to rate as a serious presentation. It must

have bewildered and alarmed the lady whose search for "rejuvenation" opened the programme and it must have had the same effect upon many women listening to it.

No consideration was given to the fundamental research done by the cosmetics industry during the past ten years. Part of the responsibility for this omission must be shared by the industry itself because of its lack of control over its advertising experts whose propaganda obscures the serious work being done.

Permanent pleats in wool

THE process of cold waving hair is, of course, based upon Prof. J. B. Speakman's work on wool fibres carried out over 20 years ago. The same thioglycollate solutions used for this cosmetic purpose have now been adapted to crease-proofing wool. Australian workers at the Commonwealth Scientific and Industrial Research Organisation, Geelong, have devised a formulation and processing procedure by which pure wool garments can be permanently pleated and creased. All that is necessary is to spray the garment with a solution of ammonium thioglycollate followed by steam pressing or steaming in a steam box or autoclave to set the pleats or creases. The whole process is rapid and simple.

The *Si-Ro-Set* process, as it is called, is claimed to give durable creases or pleats which will withstand dry cleaning, wetting, or even prolonged immersion in water and show greatly increased wearing properties. This is because it causes a chemical reaction within the wool molecule. Some dyes are adversely affected by the treatment, but there are many which withstand it satisfactorily. Only new garments can be treated. During their subsequent life dry cleaning rather than washing is recommended. The cost of the treatment is low, probably no more than 6d. per garment.

Three firms have been licensed to manufacture *Si-Ro-Set* solutions in this country—Albright and Wilson Ltd., Robinson Brothers Ltd. and Toni Cosmetics.

This new application of ammonium thioglycollate has added powerfully to the sales appeal of wool in its fight against synthetic fibres.

Squibb's centenary

JUST a century ago Dr. Edward Robinson Squibb set up a small laboratory on the Brooklyn waterfront of New York for the standardising of drugs.

Six years earlier, when he was serving as a U.S. naval surgeon, he saw surgery being performed without anæsthesia. While anæsthetic ether had been discovered it was unreliable and frequently dangerous, so that reputable surgeons refused to use it. A safe, controllable ether was Squibb's first discovery. He produced this by inventing a continuous steam distillation process—allowing quantity production of stable ether. Squibb plants today use essentially the same basic process for making ether.

He then turned to standardising drugs for purity and strength, working in a laboratory at Brooklyn Naval Hospital in New York City. Here he also served as a physician and surgeon. He developed tests to ensure the uniform strength and purity of all drugs leaving his laboratory, signing personally the label of every product he tested. Eventually, medicinals bearing his signature were recognised and universally accepted.

The inadequate pharmacy laws in civilian life, however, were still to be overcome and in 1858 the Brooklyn laboratory came into being. Unfortunately, this venture was doomed to temporary disaster, as a few months later the laboratory was destroyed by fire. Dr. Squibb was severely injured and shortly afterwards one of his hands had to be amputated. Nevertheless, with the help of friends he rebuilt the laboratory—the forerunner of today's House of Squibb which has ramifications all over the world.

Pure ether was the forerunner of the large range of products which today bear the name of Squibb and which include anti-TB drugs, antibiotics, fungicides, curare, rauwolfia drugs, etc. Arising from their work on rauwolfia, Squibb scientists are now systematically examining a large number of folk medicines to discover if they have any scientific basis.

Help for small firms

THE problem of getting information to the people who can make best use of it is being tackled in a new way. The Scottish Council (Development and Industry), with the help of the D.S.I.R. which provided money from U.S. economic aid funds, has been running an experiment called a Technical Liaison Service. A team of three investigators, each a retired professional engineer, visited over 100 engineering firms, none with more than 500 workers, to help answer technical questions. Out of 223 questions asked, 160 were answered satisfactorily. The problems ranged over design, production, sales and finance. No attempt was made to answer enquiries on the spot. The team's job was to find the specialist to whom to pass the problem and often this was simply a matter of knowing the right research organisation.

The report of the experiment "Small Firms with Big Problems" (D.S.I.R.) reveals a wide and curious variety of attitudes towards technical information. The overwhelmingly popular source of information was "literature," presumably mainly technical periodicals. But not every firm chooses its literature wisely or makes proper arrangements for it to be read, digested and, where necessary, acted upon. The managing director of a small firm doing well with the design and installation of milling plants and dust extraction plants said that only one technical journal was taken and that anyway

articles in trade (*sic*) journals were too specialised to be useful. Almost as a corollary to this attitude is the fact that the firm had no technically qualified staff. Even a much larger firm, employing 180 people, and making marine forgings, had no technical staff and took only a few technical journals. The prosperity of firms like these gives little encouragement to the advocates of more technological education.

Needless to say, among the firms visited the Service proved very successful and it is now proposed that a Liaison Service modelled on the experimental one shall be opened shortly in Glasgow under the ægis of the Royal College of Science and Technology there. It is likely to cost £6,000 a year to begin with, the money being provided by the Scottish Education Department. Presumably this money will be a pump primer to get the scheme working until it is self-supporting. Nothing is said about charging for the service (the firms helped in the experimental investigation got it all free), but it cannot be expected that several thousand pounds' worth of information will be doled out free each year.

Veteran

CONGRATULATIONS are due to a venerable veteran of British chemical engineering, J. Arthur Reavell. Now in his 86th year, he says he has lived " a full life." That is almost an understatement, for not only has he had the pleasure and pride of pioneering in chemical engineering but also the satisfaction of running his own business for half a century. His company, the Kestner Evaporator and Engineering Co. Ltd., was founded in 1908 with a staff of two, a secretary and an engineer. Reavell was 36 and even then perhaps people told him he was getting rather old to be starting a business. In the event he has demonstrated how the years may be almost ignored. He is still chairman of the company, is still in his office on most days and still visits his subsidiary companies in Australia and South Africa every year. And he has found time to help start the Institution of Chemical Engineers and to be its President.

Why does the company bear the name of Kestner? One of Reavell's early friends was Paul Kestner, the French physicist. The company was started by taking over the British Empire rights in Kestner's climbing film evaporator and other plant. To these patents Reavell has added a long string of his own, some concerning evaporators, others chemical plant and the fabrication of materials like silicon iron, Keebush and Keeglas. Technically his enthusiasms have always been in the diversity of application of chemical engineering principles and of new materials of construction. It is safe to say that there is scarcely an industry in which Kestner plant is not to be found.

As he says, " I have lived a full life and I intend to go on doing the same." We wish him just that.

Fluoride dentifrices

IN spite of the assurances of medical authorities many people are genuinely opposed to the fluoridation of water supplies as a means of reducing dental decay.

They argue that fluoridation deprives citizens of the right to drink untreated water if they so wish and as such constitutes an attack on the liberty of the subject. Whether or not these opinions are wrongheaded they should be respected. The simplest way out of the dilemma is not to fluoridate water supplies but to provide people with another means of applying fluoride to their teeth if they so wish.

By far the best means, of course, is fluoride dentifrices.

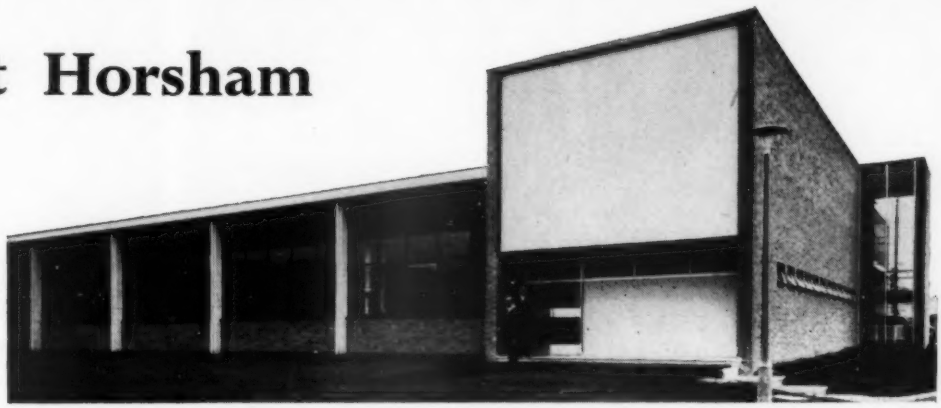
The Americans have been marketing fluoride dentifrices for three years. They are formulated to contain about 1,000 p.p.m. or 0·1% total fluoride, usually as sodium fluoride or stannous fluoride. (Fluoride is added to water at the rate of 1 p.p.m.) Before they could be marketed the manufacturers had to convince the U.S. Food and Drug Administration that they were completely safe. The F.D.A. was particularly concerned about the hazard to children already drinking naturally or artificially fluoridated water. The hazard, incidentally, was that of mottling the teeth. (The possibility of children eating fluoridated dentifrice with ill-effects was ruled out as virtually non-existent owing to the physiological inability of the human stomach to accept lethal quantities.) Because reassuring evidence on mottling could not be produced all fluoride dentifrices had to carry a cautionary label, *i.e.*

" Children under six should not use fluoride toothpaste. Consult your dentist about fluoride toothpaste if your local water supplies contain fluoride."

Since then a great deal of work has been done by manufacturers on both the safety and effectiveness of fluoride toothpastes. Stannous fluoride has been shown to be more effective in reducing decay than sodium fluoride. Furthermore the ability of stannous fluoride dentifrices to inhibit lactic acid decalcification on permanent teeth appears to extend to deciduous enamel. On the question of safety, extensive tests on children have indicated that the use of a stannous fluoride dentifrice is not associated with any increase in urinary fluoride output or, therefore, with increased fluoride intake. The possibility of such toothpastes producing mottling of the teeth is also considered negligible.

The results of these investigations have resulted in the F.D.A. withdrawing its demand for cautionary labelling. Henceforth stannous fluoride dentifrices are considered to be safe for children "of all ages." The work which resulted in this conclusion is described by S. L. Cooper of the Procter and Gamble Co. in the June 1958 issue of the *Proceedings* of the Toilet Goods Association.

Ciba's New Production Building at Horsham



Ciba Laboratories have just completed extensions costing £250,000 at their Horsham (Sussex) factory. There is a new 30,000 sq. ft. production building for the manufacture and packaging of tablets and the storage of materials, and a new boiler house to service the whole factory. The new building doubles production facilities at Horsham.

WITH the coming into production of their new building at Horsham, Ciba Laboratories Ltd. have taken another important step in the systematic expansion of their business which has been going on for 10 years. The original building at Horsham, built in 1938 and still a model of its kind, is now used almost entirely for administrative purposes. Chemical manufacturing has been transferred to a factory at Pyewipe, Grimsby, itself now undergoing considerable enlargement. Pharmaceutical processing has been transferred to the new building at Horsham and to an adjoining, slightly smaller building, erected in 1952. The two buildings provide nearly 54,000 sq. ft. for processing, packaging and storage. In addition a new boiler house has been erected to replace the original boiler room in the main building.

The Minister of Health, Mr. Walker-Smith, starting up the machine for making tablets of Ciba 1906, the anti-leprosy drug. On the right is Ciba chairman, Sir Arthur Vere Harvey, and beside him the managing director, Mr. P. B. Mair.

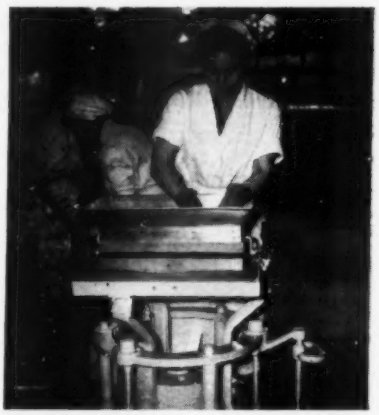
The new building was officially opened on July 16 by the Minister of Health, Mr. D. Walker-Smith, who started up a tablet machine to produce for the first time in this country the new anti-leprosy drug, Ciba 1906 (4-butoxy-4'-dimethylaminodiphenyl thiourea).

Flexibility is the key feature of the building, the partitions of which can be easily moved to rearrange the layout. The building is of striking contemporary design with huge areas of windows to give a flood of natural light. Inside walls, doors, girders and machinery are painted in yellow, pink, grey and blue to give a remarkably pleasant working environment. Pastel shades are repeated in the floor tiles, which are washed daily by a mechanical scrubber and suction dryer. Portable vacuum cleaners are in constant use to eliminate dust and each tablet machine is fitted with its own dust extraction system.

On entering the building the visitor is confronted with the impressive sweep of the 10 ft. corridor which stretches 210 ft., the length of the building. This corridor bisects the 130 ft. wide building. On one side is the storage area with a height of 24 ft. On the other is the tableting and packaging areas with a ceiling height of 12½ ft., the 4-ft. space above being used for ventilation and service piping. A 20 ft. section through the full

The Roses of Gainsborough cartoning machine packing Bradosol lozenges at the rate of 100 per min., including insertion of leaflets.

Soder granulating machine which can handle tablet ingredients at the rate of 240 kg./hr.



Russell vibratory machine for filling tablets into tubes.

width of the building at the south-east end is divided into two floors and accommodates well-equipped cloakrooms, tea and recreation rooms. The corridor is equipped with large sliding doors, 6 ft. wide by 10 ft. high, so that fork-lift trucks can be used to move materials into all working areas.

Production areas are lighted throughout with fluorescent tubes to provide 20 lumens per sq. ft. at bench level. Natural light is admitted through 2,193 sq. ft. of windows.

The erection and equipment of the new building and the boiler house cost close on £250,000. It is an indication of the startling rise in costs that the original and much larger Ciba building at Horsham cost less than £100,000 in 1938.

Production of tablets

In the storage area of the building all materials are placed on pallets or in metal baskets which are stacked and moved by fork-lift truck or fork trolley. Pallets and baskets are numbered and a quick reference index system enables the required materials to be found almost instantly.

The doors of the loading dock are arranged to form an airlock, so that the minimum of heat is lost from the building during loading and off-loading. The outer doors are power driven.

Ultimately tablet materials will be delivered by fork-lift truck to the upper floor, from where they will flow by gravity into sifting machines working at 240 kg./hr. From the sifters the materials will flow into large storage hoppers equipped at the base with a control valve enabling the sieved materials to be run directly into containers for weighing.

Correct quantities of materials for each batch of tablets are transported collectively to the granulating room. Here there are small mixers with capacities of 50 to 60 kg. and large mixers which can take up to 150 kg. There are three granulators: a Swiss Soder machine which will handle 240 kg./hr., an Apex machine which will handle 200 kg./hr., and a Manesty machine which will process up to 100 kg./hr.

There are three drying ovens, 20 tray, 40 tray and 80 tray. The smallest has a capacity of 60 kg., and the largest four times as much. The two larger machines have mobile racks for trays.

In the spacious tableting room there are eight Manesty presses. Five are 16 punch machines each of which can produce from 15,000 to 22,000/tablets per hr., one is a 27 punch machine which can produce up to 75,000 tablets per hr., and two are 33 punch machines which individually can punch out nearly 100,000 tablets per hr.

As mentioned, each tablet press has its own dust-removal equipment. In addition it has a balance for check weighing tablets. Most have vibratory equipment for removing dust and flash from tablets as they leave the machine. There is also an electronic counter by C. E.

Ciba 1906

The new anti-leprosy drug now being produced at Horsham by Ciba Laboratories was discovered by Ciba workers in 1953. Since then it has been clinically tested for 3½ years, mainly in Nigeria.

At first it was known as SU 1906. Chemically it is 4 - butoxy - 4′ - dimethylamino-diphenyl thiourea. It is a white almost tasteless powder, m.p. 91°-94°C. It is sparingly soluble in water and readily soluble in acetone. It is orally active and is presented as 0·5 g. tablets.

It is claimed to be better tolerated than the present basic anti-leprosy drug, dapsone. Also, treatment is shorter than with dapsone, though still lasting two to three years. The market for Ciba 1906 is enormous; there are 9 million lepers in the world, 3½ million of whom are in the British Commonwealth.

King for direct filling of containers from the tablet machine in appropriate cases.

Tablet packaging

During the visit *Bradosol* lozenges were seen being filled into aluminium screw - capped tubes which are gradually replacing glass containers. The tablets are filled 3,000 at a time by a gyratory vibration machine (Russell Constructions). The tubes are placed upright in a rectangular box and the tablets are tipped into them and shaken down by vibration. Each tube receives 21 tablets and the top one is removed from each tube by a vacuum nozzle. Imperfectly filled tubes are rejected by a weight check during capping.

Other counting and filling methods shown included the Russell *Finex* machine in which gyratory vibration is used to feed tablets into channels from which the correct number are released on each cycle by the operation of a bottle filling funnel.

In the *Triumph* electronic counting machine (C. E. King and Sons Ltd.) tablets are fed from a hopper on to a turntable designed to pass tablets in a single file through a beam of light focused on to the photoelectric cell. When the correct pre-set number of tablets have passed, a flap moves over, diverting the tablets into another container. The first filled container is replaced by an empty one to receive tablets after the second is filled, and so on. The capacity of the machine is 1,500 tablets per min.

Hand counters consist of a pivoted plate having the appropriate number of holes of suitable size and shape. The counter is pushed into a heap of tablets, the excess tablets are shaken off, the plate is lifted and the released tablets slide into the container.

In a *Triumph* counter for sugar-coated tablets a hopper has in its base a rotating disc drilled with the required number of holes to the correct size for the tablets being counted. As the disc rotates, the holes fill with tablets, brushes remove the excess and above the bottle filling chutes the tablets are released. The rate is 45 bottles of 20 or 20-30 bottles of 100 per min.

Tablet ingredients are prepared in this spacious, well-lit area.

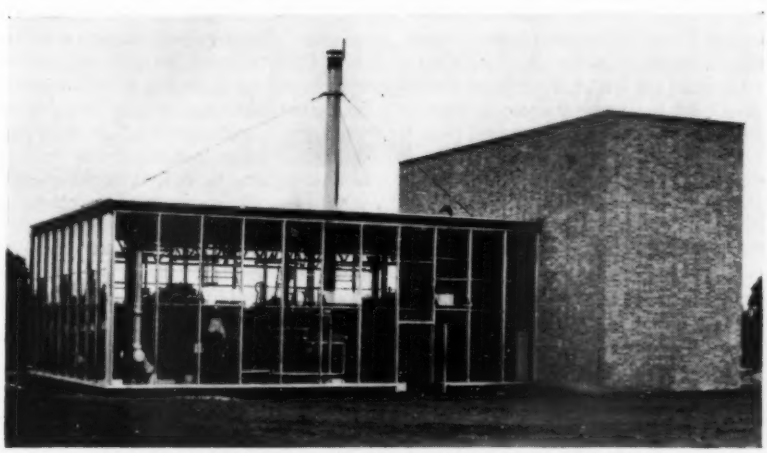
Labelling

Most labels are now thermoplastic, *i.e.* the back of the label is treated with a plastic adhesive which is activated by heat. The main advantages are greater adhesion, reduced sensitivity to atmospheric conditions and cleaner labelling. These labels may be applied by machine (Rawsons Labelling Machines Ltd.) or by hand. For the latter process, Ciba use Funditor label activators consisting of a steam oven having a sliding shelf so arranged that whilst activated labels are being applied further labels undergoing treatment.

Other operations

In the other manufacturing building at Horsham the rest of Ciba's pharmaceutical processing is carried out. Operations seen by visitors included the manufacture of ointments such as *Nupercainal* which is packed in 1 oz. tubes; ampoule cutting, washing, printing, sterilising, filling and sealing; solution preparation; bottle washing, etc.

One of the most interesting processes is the filling of *Nebulisers*. First the capillary tube is inserted into the spray plug in a special machine built by Ciba. Then the polythene squeeze bottles are placed in holders on the belt of a machine, designed and built by Ciba and filled with exact contents by pump and filling needle (no bottle—no fill device fitted). Next the spray assembly is inserted by hand and pushed home by rams. The bottles then pass to a spray testing position, satisfactory nebulisers have a talc lubricated cap applied, the caps are tightened and the complete nebulisers are ejected. All mechanical operations are compressed-air powered. The rate of machine operation is 900 per hr.



The new boiler house, equipped with oil-fired automatic boilers.

" Nearly all accidents in industry are due to human failure of one kind or another—carelessness or disobedience on the part of the worker himself or one of his fellows, failure in supervision or in plant maintenance, or bad housekeeping, which is a failure in management."

***This is one of the views expressed by* SIR WILLIAM GARRETT,**
President of the British Employers' Confederation, in this outspoken article in which he emphasises that . . .

Safe Practice is a Basic Factor in Manufacture

TOO often it is thought that safety in industry is an " extra " that can be superimposed on factory operations, or achieved by a " Safety Campaign," rather along the lines of " Buy British " or " Eat more Fruit."

This is an idea that can produce no lasting results, and in fact may rather, in the long term, slow down the drive towards safer manufacturing operations.

Safe working is a basic component of industry, and must be considered at all stages of a project; in the original research and development, in the planning and engineering stages, in the drawing up of the manual of operation, and in the training of the men who will operate and maintain the unit.

Due regard to safety aspects in all these stages is unlikely unless the responsibility for the safe performance of production is accepted by top management just as is the responsibility for efficient performance. In fact, the highest efficiency of operation cannot be obtained unless the responsibility for safe practice is so accepted. All levels of supervision have a duty to promote and maintain the maximum of safe operation in their respective spheres, but this duty will only be accepted and carried out if inspired from the highest level.

When **research** on a project is under way, full consideration should be given to possible fire and explosion hazards, to the corrosive or toxic nature of raw materials, intermediates and end products, and to possible cumulative toxic effects on workpeople.

In the **planning and engineering phases,** apart from the basic requirements of factory legislation, constant attention must be given to so many safety points that the closest collaboration with production staff and with safety engineers is essential. It is better and cheaper to make mistakes on paper than to

The Author will be better known as Dr. W. H. Garrett, personnel director of Monsanto Chemicals Ltd. He received his knighthood in the Birthday Honours and we are delighted that one of the first articles to bear his new title has been written for " Manufacturing Chemist."

rectify faults during construction or, worse still, after trouble has occurred during manufacture. Among the points to be considered at this stage are good access to buildings, good layout giving ease of movement and of control, good lighting and ventilation, ample and accessible exits at all levels, well-defined gangways, suitable fire fighting equipment, fire breaks between buildings, materials of construction of buildings and equipment, and a system of planned maintenance.

When the **operating manual** is being compiled, it is necessary that it should be complete and detailed, but equally necessary that it should be written in such a way that it is easily understood by the plant operators. In fact it should be so clearly drawn up that it *cannot* be misunderstood by the men who will use it. Potential hazards arising from failure to carry out instructions should be emphasised and details of " first aid " measures to meet any such emergencies clearly stated. This need cause no feeling of apprehension among the workmen if they have been properly trained beforehand.

This brings us on to what is probably the most important single factor in successful safety work—**the training of the workpeople.** The greater emphasis must be laid on the training of new entrants into the industry, whether they be youths from school or adults from other occupations.

In training it is of first importance that those under instruction should not get the impression that safe practice is any less vital than skilful performance. From the start the two should be linked together as part and parcel of the equipment of a good operator—and this will not be brought about unless the instructor believes it himself!

Contrary to common belief, the great majority of accidents occurring in the chemical industry do not happen owing to the specific risks of what is quite mistakenly considered to be a hazardous occupation. Most of the accidents are identical in nature with those occurring in all other industries; tripping and falling, hernias due to incorrect methods of lifting, failure of tools, ladders and stairways, traffic accidents and similar occurrences. Nearly all accidents in industry are due to human failure of one kind or another—carelessness or disobedience on the part of the worker himself or one of his fellows, failure in supervision or in plant maintenance, or bad housekeeping, which is a failure in management.

While, therefore, it is necessary to instruct the new worker about risks inherent in the work he will perform, the more difficult task is to inculcate the habit of safety in carrying out the day-to-day tasks that are common in all industries. This habit cannot become ingrained during a short indoctrination or training course, and can only be achieved by continuous instruction

over a long period, and in fact this instruction never ends.

Training should also aim at establishing habits of cleanliness; a clean factory is not necessarily a safe one, but a dirty factory is never safe. As most accidents are due to human failure, it should be obvious that the most meticulous attention to mechanical safeguards is worth little unless the training of the workpeople in safe practice is of the same high standard. This training cannot be limited to new entrants into the industry, but must be a continuous part of factory operations, a part of normal supervision.

The advantages of **planned maintenance programmes** are now generally accepted from the point of view of efficiency, but planned maintenance is also an essential safe practice in industry. Failure of badly maintained equipment is often accompanied by injury to personnel, and the minimising of accidents from this cause is not the least advantage of a properly organised maintenance system.

During actual process **operation,** scrupulous attention to safe practice is as much the responsibility of supervisors as efficient operation, and both by example and precept it is the duty of each and every supervisor to ensure that the men under his charge operate in a safe manner as a matter of course. The essence of safe working is continuity of effort, and this can only be achieved when safety ceases to be a special virtue, and is accepted as the normal way of doing things.

An essential part of the continuous effort required to maintain safe practices is the regular inspection of factory operations by the management. This is not a job to be left to the Safety Officer. His rôle is that of an expert adviser, both to management and to lower supervision, on safety methods and precautions, drawing attention to unsafe practices, and being responsible for the necessary statistical work involved. The executive functions of safe operations are a line responsibility, from top management downwards; this cannot be too often reiterated—the Safety Officer or Safety Engineer is not responsible for the safety record of the company.

Modern management carries a three way responsibility—to the customer, to the shareholder and to the workpeople. There is nothing "special" about any of these duties —all are part of the normal management function—and safe working is one of these normal duties.

The moral responsibility of management from the humanitarian angle is obvious, and goes far beyond the point made compulsory by factory legislation. The workman is entitled at least to the same care and attention as is given to the machinery and equipment among which he works.

On the other hand, safe practice is a great aid towards uninterrupted operation, minimum wastage of trained labour, and high factory morale, all of which contribute in no small measure towards efficient operation.

Summing up, safety is not a specialised activity to be worked out by one particular section of a manufacturing organisation, but both as a policy and in practice is an integral part of the functioning of all groups concerned in manufacture, research, engineering, production and services. If safety is to be accepted as a definite responsibility by each and all of these groups, it is obvious that the first acceptance of this responsibility must be on the part of top management. This responsibility is becoming more widely accepted by modern management each year, in the realisation that on all counts—humanity, morale and efficiency—it is a top ranking management duty.

Planning for Safe Operation of Chemical Plants

By E. W. Jackson, A.M.C.T., A.M.I.CHEM.E.

IN a chemical works, apart from the normal works hazards, there are additional dangers to consider which may arise from the presence of one or a combination of the following: toxic solids, liquids, vapours and gases; inflammable solids, liquids, vapours and gases; explosive substances; and materials which have a corrosive action on the skin. It is therefore important to maintain a high degree of safety consciousness where such substances are handled.

Design

The place to consider safety in any new chemical works or process is at the design stage, and the chemical engineer engaged on the design should make himself familiar with the hazardous properties of all raw materials, intermediate products, finished products and chemical reactions.

The guiding principle in the design of a plant for the handling of dangerous materials should be to keep the materials contained within the plant and not to allow them to pollute the operating area. In some cases this will apply to the whole plant, in others to a portion of the plant. The method of containment adopted will depend on the circumstances; in many instances it will be decided by economic considerations, but any plant which depends for its safe operation on the continuous wearing by workers of protective equipment, on high rates of ventilation or on limitation of the time workers are engaged on the process, is badly designed.

It should not be possible for a worker to make a mistake in operating the plant which will lead to a hazardous situation, and it is the responsibility of the chemical engineer to see his design is such that this cannot occur. The designer should see that safety devices, including explosion reliefs and flame arrestors, are incorporated in the plant where necessary. Instruments are marketed which will give an instantaneous indication of the concentration of some toxic and inflammable substances in air. Where possible, this type of instrument should be installed coupled to an alarm system to draw attention to excessive concentrations of the dangerous material. For these instruments to be of value the air sampled must be representative of that to which the workers are exposed.

Another safety aspect to be considered at the design stage is the removal of solid, liquid and gaseous waste products from the process, and suitable precautions are necessary to ensure that land, water and atmospheric pollution cannot occur.

Where a safety officer is employed he should take part in the discus-

sions on plant design, and he should have an opportunity to examine flow sheets, plant diagrams and layout drawings so that he may point out where the safety of the plant can be improved. He will also check that the various statutory safety requirements have been complied with. He will also give valuable assistance in the writing of safety and operating instructions.

Operation

The safe operation of a plant is a part of good management, and the first essential is adequate training of operational and maintenance staff. The training on the job should be supplemented by lectures on the process, the hazardous properties of the materials to be handled and the methods of handling materials safely. Where it is possible, practical demonstrations of the hazardous properties of the substances to be handled can be made a useful part of the training scheme.

First-aid equipment and protective equipment which may be required for certain operations should be regularly inspected. It is the supervisors' responsibility to see that workers obey safety instructions for the process and that protective equipment is worn when necessary.

Where instruments are not installed to detect concentrations of dangerous substances in air, chemical analysis of the air should be a routine measure. Here again, for the results to be of value, the air sampled for analysis must be representative of that to which the workers are exposed.

The limit of inflammability of gases and vapours in air may be determined with reasonable accuracy, but when considering toxicity of substances in air the limits cannot be so clearly defined. Figures are quoted in the literature for the maximum allowable concentration in air of some toxic substances, and many of these figures are based on insufficient evidence. Even in cases where the figures for maximum allowable concentrations are based on what may be regarded as adequate information, it should be recognised that the susceptibility of individuals varies, and the reaction of the same individual may vary from time to time.

It is better to use figures for maximum allowable concentrations as a guide and not use them indiscriminately as working levels. Maximum allowable concentrations should be based on a time of exposure. Some toxic substances can be tolerated for short periods in air at relatively high concentrations compared with the allowable concentration for continuous work. All too often one sees figures quoted for the allowable concentration of toxic substances without any reference to exposure time.

Accidents

There is always the danger with certain processes that in the event of fire or other mishap the remainder of the works or adjacent premises may be endangered. In these cases a plan to deal with an emergency is desirable; selected personnel should be trained to cope with the situation, and the training should be repeated at regular intervals.

Whenever an accident or dangerous occurrence takes place the circumstances should be fully investigated. All accidents and dangerous occurrences have a cause, and something can be learned from every investigation to enable recommendations to be made for improving the safety of the process.

Accident Prevention in a Modern Factory

THE management of Price's (Bromborough) Ltd., equate safety with efficiency. In a recent article in *Chemical and Process Engineering*, their personnel manager, R. D. Bromley, described how safety has been built into their modern *Emersol* plants for the continuous manufacture of stearines and oleines. These plants are the only ones of their kind in the United Kingdom. They presented a number of safety problems.

To ensure protection for the staff from toxic solvent vapour, both *Emersol* plants are guarded by a specially designed methanol detector. Stringent precautions are exercised to prevent an outbreak of fire and each of the two plants has its own separate fire alarm system operating by means of fusible links which are designed to melt at a fixed temperature and to discharge a bank of carbon dioxide cylinders.

In addition, each plant is covered by the general factory fire alarm system, the installation of which was completed in 1956 by Associated Fire Alarms Ltd.

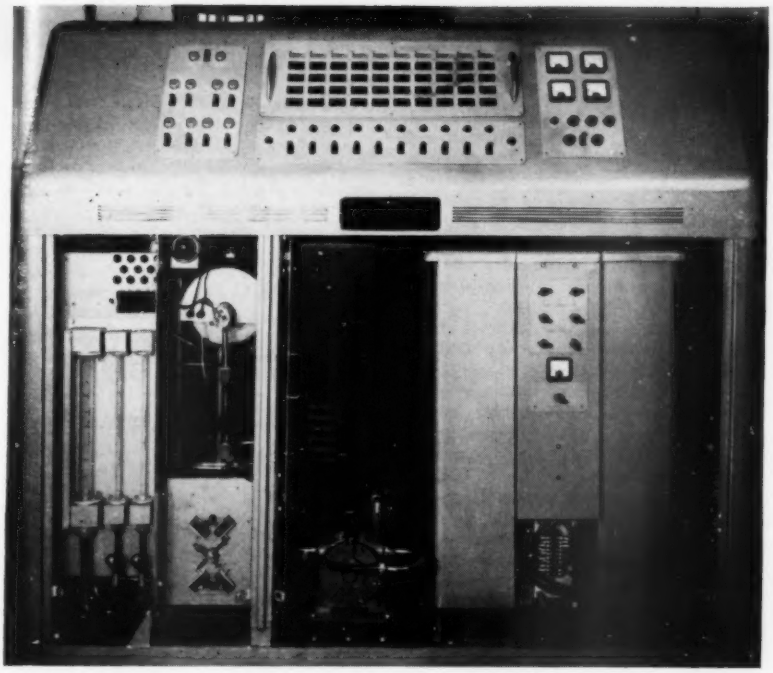
To ensure that these two vital plants are not jeopardised by the natural human tendency to take automatic alarm systems for granted, careful tests are made every week of these systems and the operatives are given fire drill instructions every three weeks, so that the building may be rapidly evacuated in an emergency. To enable the building to be entered after a discharge of the carbon dioxide cylinders, special breathing apparatus is provided and the operatives are trained in its use, so that in an emergency every man working on the process knows precisely what to do and how to do it.

Employees working in the *Emersol* plants receive a free issue of safety shoes in which no ferrous metal has been used, and all electrical equipment in the building has been flameproofed to obviate sparking. As a further safety measure only a strictly limited number of employees is permitted to enter these buildings, and then only after matches and cigarette lighters have been surrendered and the employees' names entered in the register provided at the entrance.

Methanol detector

The methanol detector serving both plants, which are housed in adjacent buildings, stands guard day and night over the health of the employees, ready to sound a strident hooter should a predetermined concentration of methanol in the air be reached. This detector analyses a sample of air from one of ten positions in each building at intervals of 108 sec. Each station is tested in turn and the cycle is repeated every 18 min. When the methanol concentration reaches 200 p.p.m., and again at 1,000 p.p.m., the detector gives visual warning signals, and when the latter concentration is reached the hooter sounds continuously.

At the sound of the hooter a strict drill is adhered to to ensure the



Methanol detector with front plates removed to show the interior. Samples of air are drawn in and tested automatically at fixed intervals. An alarm sounds if a dangerous concentration of methanol is detected.

reduction of the methanol to a harmless level and those responsible for the maintenance and management of the plant are also notified. The methanol level at which this drill is carried out is well below that at which the methanol would be dangerous to health, but to underwrite any possible failure of the detector, notices are prominently exhibited in the building describing the symptoms of methanol poisoning, so that immediate relief may be sought by an affected employee in the unlikely event of the complete failure of the system.

Fire precautions

Since the general fire alarm system was installed every employee has received individual instruction in the handling of fire extinguishers, and every section of the factory and offices has had at least one fire drill with the fire-alarm bells realistically sounding in the selected area, without prior notice, and the employees evacuating the area with all speed.

In addition to this extensive alarm system, firemen patrol the factory and office 24 hours per day and volunteer departmental fire teams receive regular and frequent training in emergency fire fighting. A senior staff fireman is responsible for ensuring that all fire-fighting and breathing apparatus is regularly inspected and tested for efficient working.

Rôle of safety officer

Compliance with the Factories Acts is regarded as a minimum necessity at Price's where the Factory Inspector is welcomed as one who seeks to help and advise rather than as a Government enforcement officer. The safety officer at this factory is not regarded as a scapegoat on whom the responsibility for safe working in the factory is thrust by a busy management. Safety is recognised as being an integral part of every employee's job on every level, from factory operative to managing director, and employees are encouraged to make suggestions to improve their working conditions and to draw the attention of their chargehand or supervisor to any hazards they encounter in the course of their work. Nevertheless, a practised eye and a mind trained to notice potential dangers are valuable aids in detecting hazards with which the employee may be so familiar that he fails to recognise them as a source of danger to life and limb. It is here that the safety officer, who was previously a production supervisor for a number of years, is of the utmost value.

By regular inspection of every section of the factory he ensures that hazards are brought to light and, by discussion with the appropriate supervisor or manager, eliminated wherever possible. Where a problem cannot be dealt with immediately, he discusses it with the engineering department to ensure that effective measures are taken to reduce or remove the potential danger and, in order that a separate channel may exist whereby awkward safety problems or untoward delays may be brought to the attention of the senior management, the safety officer is responsible directly to the personnel manager.

Plant development and safety

At Price's it is recognised that safety starts at the drawing board and the project engineers welcome the safety officer to discuss details of plant development, realising that it is easier and cheaper to make necessary alterations at this stage than when the plant has been erected and is working.

During the transformation of the factory, advantage has been taken of the opportunity to combine safety with efficiency and, for example, the sulphuric acid distribution system has been completely replaced by a new gravity feed system which has greatly reduced the possibility of acid leaks. The face shields and saline solution bottles provided are inspected each week and replenished whenever necessary by a member of the personnel department, so that these essential facilities are always ready for immediate use.

Personnel protection and welfare

To ensure that employees receive adequate protection where hazards cannot be completely eliminated, a schedule of protective clothing requirements has been drawn up after consultation with the appropriate departmental managers and supervisors and after reference to each individual's job description. The majority of the employees in the factory are supplied free by the company with two sets of overalls which are laundered and repaired at the company's expense. In addition, special reserves of safety equipment, goggles, rubber boots and safety belts are held in the protective clothing stores to meet, without

delay or formality, any extra demand for safety equipment which may arise.

In a factory the primary purpose of which is the production of organic chemicals derived from oils and fats, facilities for personal hygiene must be first class to obviate any risk of dermatitis. Accordingly the company have completely redesigned their central cloakroom, which now provides pleasant and efficient washing facilities, showers and foot baths, and separate locker accommodation installed over steam-heated pipes, for use by the factory employees. Additional facilities have been provided in parts of the factory for those employees whose work is located at some distance from the central cloakroom, and barrier creams are freely available for those employees whose work necessitates some additional safeguard.

Any employee at Price's who may be injured or fall sick during the course of his work knows that he can rely on speedy and effective attention at the health centre, which is staffed by qualified nurses throughout the day and night, and under the general supervision of the company's medical officer. As direct telephone communication is maintained between Price's (Bromborough) Ltd. and the local fire brigade and ambulance unit, a serious case of illness or accident may be dealt with almost immediately by an ambulance which can reach the factory within five minutes of a request for help and deliver the patient to hospital with all speed.

Complementary to this system for treating employees at the company's health centre is the training and organisation of the St. John Ambulance Brigade, whose enthusiastic members regularly give up part of their spare time to prepare themselves to deal with emergencies in the factory which may require immediate first-aid treatment, before the health centre can take over.

Evidence of the results of the efforts made to ensure a high standard of safety at Price's may be seen from the following comparison of frequency rates for the five years 1953 to 1957:

No. of lost-time accidents per 100,000 hr. worked	
1953	1·19
1954	1·40
1955	1·41
1956	·99
1957	·51

Safety Equipment and P

Electrical Safeguards

A number of Londex products assist towards the safe use of electricity in chemical and similar establishments.

The main interest lies in two sections—protection to users of portable apparatus — protection in hazardous areas by the use of Buxton certified flameproof equipment and intrinsically safe apparatus.

In the first category the Londex automatic earth leakage equipment has received recognition by the Electrical Inspector of Factories and is being supplied to many industrial undertakings. This equipment is designed to work on a voltage lower than the normal mains supply, it is arranged to trip the supply to the portable apparatus should there be an earth fault and also limit any shock current to a safe value (about 3 m/a). Other features of this equipment are a key-operated reset and test mechanism, an interlocked isolator and switching capacity up to 100 amp. One unit can control a number of portable appliances.

In the second category are Londex flameproof and intrinsically safe apparatus. The following products are covered: relays, relay units (up to 6 stages), pressure switches, floatless liquid level controls, float switches, air flow switches, etc.

The intrinsically safe relay units are designed to work in conjunction with various instruments and controls in hazardous areas, which need not be rendered flameproof. The following equipment can also be used in this way —air flow switches, hopper level switches, pressure and vacuum switches, float switches, rotation sensing device, flow indicators, etc.

In some hazardous areas pressurised or purging systems are utilised and Londex pressure and vacuum switches are used. These can be arranged to close an alarm circuit or isolate electrical equipment should the pressure fall below a safe level.

A Buxton certified flameproof float switch (Londex).

Isomantles for Flameproof Areas

Flameproof areas require electric heating equipment constructed in accordance with Electricity Regulation No. 27 of the Factory Act.

Isopad Ltd. manufacture a special version of their electric heating mantles, type FPM, which complies with these regulations and has been accepted for use in these areas by the authorities. They are made for process vessels up to the largest capacities and the same design is also available for smaller equipment.

Isotapes, electric heating tapes for pipelines, etc., as well as drum heaters are also made in this special version. The heating element is mineral insulated and stainless steel sheathed and terminates in a flameproof junction box. The element sheath is earthed so that no sparking or short circuit is possible. Moreover these elements are completely spillage-proof. However, it remains the user's responsibility to keep the element temperatures below the ignition temperature of the vapours or gases present.

Hydrogen Sulphide Detectors

The Thermocontrol detector of hydrogen sulphide is based on the research of the North Western Gas Board Research Laboratories, Liverpool Division.

It measures and records the concentration of H_2S in coal gas and producer gas streams, indicates the content in iron oxide box type purifiers, determines the content in natural and cracking process gas obtained as a by-product from oil drilling and oil refineries, indicates the concentration in an atmosphere where more than 50 p.p.m. may be injurious to the plant operators of oil refineries and rayon manufacturing plants. It is used in oil refineries in conjunction with sulphur extraction; and in gas purification plants.

Its method of operation is staining sensitive paper with periodic gas samples—the stain is scanned and an automatic signal given. Indicating

Protective Clothing

The Bestobell C2 Polysar asbestos suit provides protection against splash from liquid sodium.

units can be arranged so that the multi-volt relay will operate an audible alarm or an indicating alarm pilot when gas concentration reaches a predetermined amount. Six types are available for different functions.

Basically the detector consists of the following units—

1. A sensitive type chart recorder scaled in p.p.m. arranged in panel mounting. Alarm contacts can be fitted.

2. Thermocontrol sampling and detecting unit, complete with detection chamber, paper feed mechanism, photocells, adjustable resetting stain period timer, operating motor, relays and sequence interlocks, gas flow and governor assemblies for adjustment of the gas flow rate through the instrument. It is provided with a panel mounting sheet and metal housing with a hinged access door for easy servicing.

3. Floating cone type tube gas flow meter for checking required gas rate.

Mercury Vapour Meter

Chronic mercury poisoning, "mercurialism," arising from the regular assimilation of Hg vapour when present in air, is now recognised as an industrial hazard and one which can easily have been underestimated. The appreciable vapour pressure at room temperature can easily build up beyond toxic limits and continued exposure to such concentrations involves risks which are accentuated by the odourless character of the vapour and the insidious symptoms. American research suggests 100 $\mu G/m^3$ as a toxic limit and more recent British opinion would lower this to 75 $\mu G/m^3$.

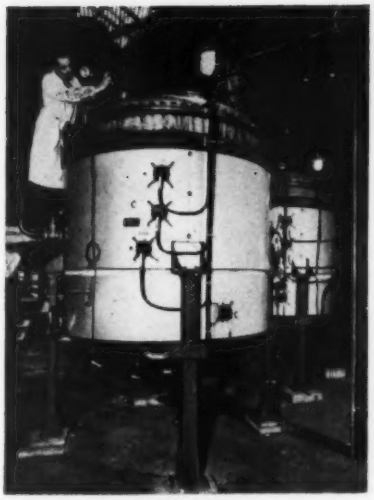
Furthermore, small traces of Hg vapour can "poison" catalysts and semi-conductor materials such as pure silicon. An accurate method of detecting and measuring such traces in industrial process gases is, therefore, needed.

The mercury vapour meter developed by the Hanovia Lamps Division of Engelhard Industries Ltd. measures and indicates by dial readings the mercury vapour content of the air in a room or the level of Hg contamination in other gas systems. The principle employed is the absorption by Hg vapour of ultra-violet rays at a wavelength of 2,537 A.U. A low-pressure mercury resonance lamp is mounted at one end of a cylindrical chamber, at the other end of which is mounted a photocell. The chamber is kept replenished with air drawn from the atmosphere to be tested by means of an auxiliary jet pump, or the instrument may be connected directly into a low-pressure closed circuit. The radiation from the lamp passes through the test atmosphere and its intensity, as received by the photocell, is indicated on the micro-ammeter mounted on the front panel of the instrument.

Pressure-charge-operated Extinguishers

The Nu-Swift extinguishers for use in the factory are the air foam extinguisher for inflammable liquid fires; and the dry powder extinguisher for fires involving inflammable liquids, gases and electrical equipment.

The body of the air foam extinguisher is filled with plain water. Suspended inside is a metal drop-in charge, consisting of two sections. Screwed separately into the top of the charge by its carrier ring is the sealed pressure container which holds the propellant CO_2. Underneath this, forming part of the pressure charge, is the liquid air foam concentrate, sealed in a plastic bag. So the air foam extinguisher has in a pressure container the same gas which, in the chemical foam machine, is laboriously and uncertainly produced by the mixture and reaction of chemical



Isomantle heating a 25 gal. stainless steel vessel in flameproof area.

When the knob of the extinguisher is struck, a brass piercer, at the end of the plunger, perforates the thin seal of the pressure charge and the released CO_2 instantly ruptures the plastic bag. The liquid air foam concentrate is thus forced into the water in the body of the extinguisher. Thorough mixing of foam concentrate immediately takes place, the solution being driven up through the stainless steel diptube, through the reinforced rubber hose, and into the aluminium alloy nozzle where it is aerated into foam. The pistol-shaped nozzle attachment enables the fire-fighter to direct the 23 ft. foam jet accurately and easily above the fire. The period of discharge of the 16 gal. of foam is 50 sec., but the discharge can be interrupted by kinking the 39 in. rubber hose.

The Nu-Swift dry powder extinguisher is a more recent fire-fighting technique.

By reducing the radiant heat or oxygen or by interposing negative catalysts, fires can be halted. The extinguishing effect of dry powder is produced by projecting into the flames a spray of fine particles. By a combination of their chemical and physical properties as well as the degree of their dispersion, these particles halt the innumerable chain reactions which form the flames.

Dry powder extinguishers are available in two sizes: Model 1604 contains 4 lb of dry powder which is expelled in 8 sec. It weighs 10½ lb. The extinguisher can be recharged with a fresh pressure charge in 30 sec. Model 1630 contains 30 lb. of powder, which is expelled in 28 sec. With the quick-release, two wheel trolley that can be supplied, its total weight is 59 lb.

The company state that model 1630 is capable of putting out a 250 sq. ft. petrol fire in 28 sec.

The Foamite "Fireball" extinguisher was designed to give speed of movement.

"Fireball" Extinguisher

Foamite have developed a dry chemical extinguisher consisting of a spherical container of light welded steel, having a capacity of 150 lb., and fitted with a ring handle filling cap with O ring and safety valve. It is pressurised with standard Foamite 5 lb. CO_2 extinguisher discharging into the sphere through a preset reducing valve. A cylinder carried on a frame has a holster and locking band.

The tubular steel chassis has rubber cushion tyres on disc wheels. It carries the cylinder and 30 ft. of ¾ in. bore rubber pressure discharge hose terminating in the sphere and coupled with a non-recoil pistol grip discharge nozzle giving a flat fan discharge. The unit is 3½ ft. high with a width over wheels of 2¼ ft. It is 2 ft. 10 in. deep. When empty without the CO_2 bottle and powder, it weighs 158 lb. Filled it weighs 326 lb.

Flame Failure Monitor

Thermocontrol flame failure devices are designed for installation in boilers.

They provide immediate flame detection by electronic means and are linked to magnetic valves which cut off fuel supply when ignition fails.

When flame is not established, or when it fails, both fuel and ignition are automatically switched off and the system is in a state of lock-out which requires manual resetting. They monitor not only the main flame but the pilot flame as well.

There are two types—those for manually ignited or manually controlled spark-ignited gas and oil burners, and those for automatically controlled spark-ignited burners under the on-off demands of a thermostat or time switch.

Fire-Resisting Doors

Durasteel steel-and-asbestos panelling is used for fire-resisting doors. Sliding and side-hung doors of this kind are made by Durasteel Ltd. to individual requirements. The material consists of light-gauge steel facing sheets bonded under a pressure exceeding 2 tons p.s.i. to a highly compressed asbestos composition core. The method of bonding eliminates cleavage and imparts rigidity to the metal. The standard facings are galvanised steel, but non-magnetic copper and half-yard aluminium-alloy are available as non-standard alternatives. An example is the *Duracheck*. The leaf is ⅞ in. thickness laminated steel-and-asbestos bound round all edges in stout 10-gauge channel section.

The *Fireman* sliding door consists of ¾ in. single thickness *Durasteel* 3DF2 sheets bolted to framing members of steel angles, tees and flats. For sliding doors to meet L.C.C. regulations, ground stay guide rollers replace the sunken channel floor track.

Durasteel doors have undergone frequent tests at the Joint Fire Research Station at Boreham Wood, to demonstrate their compliance with official regulations and insurance standards.

P.V.C. Clothing and Gloves

James North and Sons Ltd. offer a comprehensive range of protective clothing manufactured mainly from a strong textile fabric impregnated and coated with P.V.C.

The material is made up into a wide range of garments which affords safety in handling noxious and dangerous chemicals of many types. The North range includes boilersuits and aprons, overalls, coats and jackets, trousers and leggings, and also covers a comprehensive range of industrial protective headgear and visors. For hand protection the organisation manufactures gloves of all types. P.V.C. fabric supported gloves form the main part of the company's range, however, and are available in a wide variety of types and sizes. Lightweight gloves for jobs requiring flexibility and acute sense of touch are manufactured with either knitted wrists or gauntlet cuffs. The standard weight or medium range of gloves is made in lengths up to 22 in. and is specially recommended by the firm for operations which involve the use of many dangerous and corrosive chemicals. Also available are heavyweight gloves, designed for use where toughness and abrasion resistance are the main requisites. Mittens and one-finger mittens are also manufactured in standard and heavy weights, and these are considered suitable for jobs where finger control is unnecessary.

Other special types of gloves produced by the North Group include P.V.C. palm-coated gloves which have

The North range includes this P.V.C. coated suit.

open fabric backs for ventilation in hot atmospheres, a lightweight laboratory glove, air-pressure tested to 201 b.p.s.i. and a new range of *North-Jomac* and *Northern* loop-pile knitted gloves, these being intended mainly for protection of the hands against rough surfaces and sharp edges, etc. The thick loop-pile fabric from which the gloves are made serves to "cushion" the hands against hard and bruising shocks, and the tiny air cells locked in the fabric insulate against heat and cold.

Hand and Face Protection

An electrical engineering firm, Martindale Electric Co. Ltd., also manufactures protective equipment for the hands and face.

Their gloves are made from PVC bonded to an interlock fabric lining. They can easily be cleaned and sterilised by washing in boiling water using a mild detergent or soap and can also be turned inside out and the linings washed.

Martindale manufacture the gloves in a variety of sizes and finishes for medium, light or heavy work and with open or close-fitting wrists. The gloves can also be had with ribbed safety palms.

Also available is a lightweight face mask for protection against some 400 non-toxic but irritant dusts from asphalt, sulphur, textiles, paper products, straw, hay, grain, flour, wood, leather, tobacco, etc.

The mask weighs just under ½ oz. and consists of a soft rolled aluminium frame and gauze filter pad. The advantage of the pliable aluminium frame is that the worker can mould it with his fingers until it fits comfortably over his nose and mouth. The mask is held in position with elastic side straps.

Two in the range of Martindale P.V.C. protective gloves. On the left is a smooth finished, knitted wrist type and on the right is a rough finished open wrist type.

The filter is made of long staple cotton wool with outer layers of closely woven aseptic gauze. It is the only part of the mask which comes into contact with the wearer's face, so reducing the risk of skin irritation. The filter pads are renewable and when a worker draws a mask from the stores it is supplied with a clean filter pad. In this way there is no risk of infection being spread. In many factories each worker has his own mask

Martindale also supply goggles and eyeshields. They are fully-ventilated, light and compact, and optically correct. A special eyeshield can be used in conjunction with the mask, by operators who normally wear spectacles.

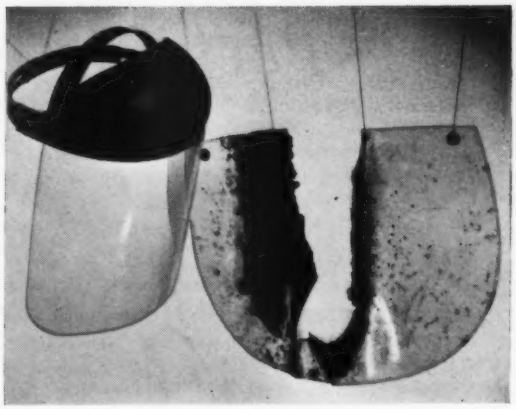
Respirator

The Draeger "semi-mask" respirator 74/545, which is marketed by Panorama Equipment Ltd., has been approved by H. M. Inspector of Factories for protection against dust particles in the dangerous size range 0·5 to 5 microns.

The mask is available in two sizes, medium and oversize. The rubber body is equipped with a packing frame and a chin rest. Inhalation and exhalation resistance is perceptibly reduced by the use of an enlarged inhalation valve and by the two exhalation valves fitted on either side. The filter chamber has a lid which can be opened. It is attached eccentrically to the mask body.

A coarse dust filter is used against non-noxious but irritating dusts from coal, lime, flour and wood. For obnoxious dusts from glass, abrasives and quartz, a coarse dust filter and ring-shaped fine dust filter is supplied. Filters giving maximum protection against solvents and organic vapours, acid gases, sulphur dioxide and ammonia can also be supplied.

This photograph illustrates the protection a worker received from an Angus faceshield. He was working at a cyanide salt bath at 1·200°F. when an eruption scattered cyanide 35 ft., setting fire to workers' clothes at 30 ft. The man operating the bath was only a foot away from the point of the eruption and must almost certainly have lost his life but for the protection of his faceshield. His only injury was a small burn on the top of the head where it was not covered.



Gloves and Gauntlets

George Angus and Co. Ltd. include in their range of protective clothing various qualities of rubber gloves and gauntlets. Black super gloves, with a high natural rubber content, provide protection against many chemicals, acids and alkalis, whilst grey general purpose gloves afford better abrasion resistance while still giving good chemical protection. Both types are available in many sizes, and wrist and gauntlet lengths.

Another form of hand protection consists of Angus PVC gloves and gauntlets. These are resistant to acids, alkalis, solvents, oils, caustics, etc., and are available in various sizes, lengths and qualities.

Goggles and Faceshields

The Angus range also includes goggles and faceshields. Some of their plastic faceshields give additional protection to head and shoulders, others incorporate moulded fibre shrouds at top and/or bottom. A red rubber chemical goggle closely fits the face while allowing ordinary corrective spectacles to be worn underneath when necessary.

Aprons

Angus PVC rubber and neoprene aprons afford protection against acids, alkalis, solvents, kerosene and oils. Various sizes and colours can be supplied. Their fabric-supported PVC garments are non-inflammable and impervious to acids, alkalis, solvents, spirit, oils and greases. Several styles are available, including surgical type coats.

Clogs

Clogs are worn by many chemical factory workers. They are hard wearing, will stand up to rough usage, and ensure warm dry feet. Angus make the *Blucher* general purpose clog. A flap covering the lace holes prevents dangerous chemicals and liquids from entering. Protective steel toecaps and felt linings can be fitted if required.

As an alternative to clogs, special grades of rubber kneeboots giving protection against oils, acids and other industrial chemicals are supplied.

Asbestos Suits

Bell's Asbestos and Engineering Ltd. manufacture protective clothing both for fire-fighting and for use by process workers in conditions of heat or fire hazard. The standard range of clothing includes gloves, gauntlets, aprons, overalls, helmets, spats, leggings and overshoes in wide variety. Specialised garments are developed to fulfil the exacting requirements of the process industries, chemical industries, chemical industries and the armed services.

An example is the *Bestobell C.2* Polysar asbestos suit. This was developed in conjunction with the Research and Development Branch of the U.K.A.E.A. for use by laboratory and process workers handling or working adjacent to liquid sodium. The suit provides protection against splash, the lightweight asbestos cloth from which it is made being coated with a film of synthetic rubber which is impervious and which presents a smooth surface from which splash will fall harmlessly away.

More Information

We shall be pleased to give further information about safety equipment and protective clothing. Enquiries sent with the coupon appearing in this issue will be promptly dealt with. Send them to the Enquiry Bureau at Leonard Hill House, Eden Street, London, N.W.1.

Perfumes for Cosmetics

2. FACE CREAMS

By V. Vasic, CH.E.

In his previous article in this series Mr. Vasic discussed perfumes for face powders. Here he considers face creams. Since these are used generously and very often are left on for some time, the perfumes should be light and refreshing. Ingredients and formulation are considered in the light of stability and irritant potentialities. Six tested formulæ are given.

IN face creams the perfume has to mask the odour of the raw materials, which may be unpleasant, and to modify it agreeably. The creams are usually applied in rather generous amounts and are sometimes left on the skin for long periods. The perfume, therefore, must be light and refreshing.

The floral, in particular the light floral, perfumes are the most popular in creams. For some creams, particularly those used in smaller quantities, the fancy and oriental perfumes have been found acceptable.

The same perfume may be used for perfuming different types of creams. The smell of basic raw materials combined with the covering smell of the perfume will produce a new note, but this is not true with all perfumes and creams, because some perfumes will produce rather unpleasant smells when incorporated into different types of creams.

Vanishing, powder and all-purpose creams

These creams are usually covered by face powder after application. The perfume of the cream should not become too dominant over the powder perfume or clash with it. Light floral perfumes are most popular for these creams, especially rose, lily-of-the-valley, jasmin and lilac.

Cream Perfume A.P.87

For Vanishing, Powder and All-Purpose Creams

Phenylethyl alcohol	25
Sophora 53, Givaudan	20
Citronellol	10
Linalyl acetate	10
Cinnamic alcohol	10
Linalool ex Bois de Rose	5
Vetyvenol	5
Ylang-ylang, Bourbon	2
Lilial, Givaudan	1
Versalide	2
Deltyl	10
	100

Cream Perfume A.P.90

For Vanishing, Powder and All-Purpose Creams

Phenylethyl alcohol	20
Terpineol, perfumery grade	10
Nerol	10
Floralys 238, Givaudan	30
Linalool ex Bois de Rose	5
Jasmin 444, Givaudan	5
Raldeine Delta, Givaudan	5
Rose Orient 34, Givaudan	2
Versalide	3
Deltyl	10
	100

Cream Perfume F.V.

For Vanishing, Cold and Cleansing Creams

Terpineol, perfumery grade	16·85
Hydroxycitronellal, perfumery grade	14·00
Geraniol	9·50
Sandalwood oil, Mysore	7·30
Bergamot oil	4·20
Benzyl acetate	4·10
Alpha-amyl cinnamic aldehyde	2·10
Methyl phenyl carbinyl acetate	3·70
Anisaldehyde ex Anethole	3·20
Rhodinol	3·15
Linalool ex Bois de Rose	3·70
Geranyl acetate	3·10
Phenylethyl alcohol	2·00
Amyl salicylate	1·90
Linalyl acetate	1·65
Methyl ionone	1·60
Methyl anthranilate	1·30
Ylang-ylang oil, Bourbon	1·20
Geranium oil, Bourbon	0·40
Methyl iso-eugenol	1·13
I soeugenol	0·60
Cyclamen aldehyde	2·00
Dimethyl benzyl carbinol	4·60
Cinnamic alcohol ex Styrax	1·20
Musk ambrette	2·55
Heliotropine	1.65
Vanillin	0·30
Coumarin	0·95
Octyl aldehyde, 100%	0·07
	100·00

Cold, cleansing and massage creams

These creams remain on the skin for a short period only, but on application they are massaged strongly into the skin. Perfumes with fresh notes are best for these creams. Perfumes based on lavender, eucalyptus, conifer oils and other camphor-containing oils, especially terpeneless, are suitable.

Cream Perfume A.P.88

For Cold, Cleansing and Massage Creams

Phenylethyl alcohol	20
Citronellol	20
Geraniol	10
Geranyl acetate	10
Sophora 55, Givaudan	10
Cinnamic alcohol	10
Methyldiphenyl ether	10
Rhodinol	5
Lilial, Givaudan	5
	100

Cream Perfume A.P.89

For Cold, Cleansing and Massage Creams

Citronellol	20
Sophora 55, Givaudan	20
Phenylethyl alcohol	13
Linalyl acetate	10
Terpineol, perfumery grade	10
Lilial, Givaudan	10
Geranyl acetate	5
Cinnamic alcohol	5
Irisone pure, Givaudan	5
Versalide	2
	100

Emollient creams

To this category of creams belong lubricating creams, skin foods, hormone and vitamin creams. Creams containing lanolin, cholesterol, vegetable oils, lecithin, cocoa-butter, etc., create some difficulties for the perfumer because of the definite odours of the raw materials. A balance must be maintained so that sufficient perfume is used to mask the odour of raw materials without making the scent of the finished cream too overpowering. Emollient creams are usually applied in rather generous amounts and, in some cases, are left on the skin for a long period, usually over-night. The perfume, therefore, should be light and fresh. Fresh rose and violet types appear to be most suitable for this purpose.

Eau-de-cologne types and other perfumes based on lemon and orange oils containing large amounts of terpene and skin-irritating aldehydes are quite unsuitable.

Cream Perfume R.V.

For Skinfoods, Emollient and Lubricating Creams

Terpineol, perfumery grade	15·0
Bergamot oil	15·0
Geraniol	14·5
Phenylethyl alcohol	10·0
Geranium oil, Bourbon	5·0
Rhodinol	3·0
Palma Rosa oil	2·0
Sandalwood oil, Mysore	10·0
Clary sage oil	4·0
Linalool ex Bois de Rose	5·0
Linalyl acetate	2·0
Patchouli oil, Singapore	2·5
Petitgrain oil, Paraguay	2·5
Ylang-ylang oil, Bourbon	2·0
Neroli, artif.	1·0
Musk ketone	5·0
Veraroma Tolu, Staff. Allen ...	1·5
	100·0

Concentration of perfume

Face creams should contain as little perfume as possible, but the concentration must not be so low that the scent will fade away after a very short period of time. The amount of perfume should be just powerful enough to cover the dull and sometimes unpleasant odour of the cream base, and to give a pleasant and refreshing effect when the cream is applied to the skin, or when smelt in its container.

The concentration of cream perfumes is generally between 0·2 to 1% with the latter used only in rather exceptional cases. The amount of perfume depends upon the type of perfume, the degree of lightness or heaviness of the odour, cost, the odour of basic raw materials in the cream which may require coverage, and the nature of intended use of the cream.

For perfuming vanishing, powder and all-purpose creams 0·25 to 0·6% of perfume is usually used. For perfuming cold, cleansing and massage creams 0·2 to 0·5% of perfume is sufficient. For perfuming emollient creams the amount of perfume to use will depend upon the inherent odour of the cream base, but in the main the addition of 0·5 to 1% of perfume is sufficient.

Incorporation of perfume

The method of perfume incorporation into a cream depends upon the nature of the emulsion and must be adapted for each particular type of cream. The perfume should not be added to the emulsion when the cream is very hot, because the perfume may break down. It should be added during cooling, after the cream has been completely emulsified, and the temperature has dropped to about 45°-50°C. After addition of perfume stirring is continued for at least ½ hr. in order to obtain proper distribution of the perfume into the cream. Incorporation is more easily accomplished in a water-in-oil emulsion because the perfume is dissolved in the oil phase. In an oil-in-water emulsion it is the best to add the perfume ½ hr. before the completion of mixing.

Perfume influence on emulsion

Although perfume is used in relatively small amounts in perfuming creams, its effect upon the stability of emulsions may be considerable, depending to a large extent on the emulsion formulation. In the oil-in-water type of creams the addition of up to 1% of perfume is not likely to result in a visual breaking of the emulsion, although a change in viscosity is possible. Many perfume ingredients are surface active and greatly modify the surface effect of emulsifiers. They may assist in stabilising an emulsion, but more often they weaken the influence of the emulsifier by successful competition at the interface of the oil and water. The water-in-oil type of creams are very susceptible to the influence of certain perfumery ingredients which may well be more surface active than the emulsifier employed.

Face cream perfume compounding

Instability and skin irritation. In compounding the aromatic ingredients must be considered in regard to the irritation they can produce and their stability in the cream bases.

Face creams are more likely to produce irritating reactions than other cosmetics because of long contact with the skin, the relatively large amounts of cream making this contact, and the manner in which it is rubbed into the skin. The irritation must be considered not only when selecting perfume ingredients, but when basic raw materials are chosen as well. Some of the ingredients used in creams may be irritants and this should be determined before the incorporation of any perfume.

Some perfume materials have a bad reputation for irritation or sensitisation although the pertinent information appears to be more putative than experimental or clinical. According to some authors hydroxycitronellal and the complexes and bouquets containing it, such as lilac, lily-of-the-valley, cyclamen, especially in association with benzyl benzoate, terpineol or phenylacetic aldehyde, produce a burning sensation on the skin. However, in the given formulae pure hydroxycitronellal, even as a major part of the composition, proved to be an excellent ingredient for skin cream perfumes and to be free from irritating effects.

Oil of cloves, eugenol and isoeugenol, which are bases of carnation type of perfume compositions, should be avoided or used only in very small amounts. Since both eugenol and isoeugenol are phenol derivatives of comparatively low molecular weight, it is conceivable that in concentrated form they might have an untoward effect upon the skin. They are not stable in alkaline media, they change their odour and tend to redden the skin, which on exposure to the sun may become slightly yellow. Oil of cinnamon contains irritating ingredients and is also apt to cause discoloration.

Eugenyl acetate, isoeugenyl acetate and isoeugenyl benzoate produce an unpleasant burning sensation on the skin.

Aromatic substances with acid reaction, such as phenylacetic acid, should not be used in face cream perfumes. Phenylacetic acid bleaches, hardens and wrinkles the skin, and can cause real epidermic trouble after prolonged contact.

Phenylacetic aldehyde easily polymerises and should be replaced by benzylethyl carbinol.

Benzyl benzoate, used in large amounts, may cause very bad irritation if the cream is applied near the eyes. Most aldehydes, benzyl alcohol, benzylidene acetone and similar compounds must be avoided whenever possible.

Resinoids and essential oils rich in terpenes and sesquiterpenes should be avoided, as they contain resins or products which tend to resinify and block the pores of the skin.

Discoloration. Most face creams are almost white and even a slight discoloration is readily noticeable. Many perfumery ingredients darken on exposure to light, or form coloured compounds with other substances. Creams containing alkalies,

even when neutralised by fatty acids, often present problems of discoloration. Perfume ingredients such as indole, methyl anthranilate,eugenol, isoeugenol, skatole, vanillin, ethyl vanillin, citrol, condensation products of methyl anthranilate and quinolines in association with musk xylol, should be avoided in perfumes intended for creams with alkaline reaction. In addition, *n*-methyl anthranilate, heliotropin, heliotrope amorphe, anisic aldehyde, bromstyrol, methyl eugenol, and methyl isoeugenol also discolour in alkaline medium. The creams may turn slightly yellowish-brown and, what is most important, this colour may stain the skin. If used in creams which have already been tinted, these perfume ingredients may also cause the colour to fade or change entirely.

Even if a single aromatic ingredient has proved to be stable, it may cause discoloration in a cream in association with other ingredients. Ingredients which discolour one cream will not necessarily discolour another with a different formula.

Recommended ingredients

In compounding skin cream perfumes it is desirable to use small amounts of aldehydes, phenols and ketones or completely avoid some of them, and to rely largely on alcohols and esters.

Primary alcohols such as rhodinol, geraniol, citronellol, nerol, phenylethyl alcohol, santalol, phenylpropyl alcohol and essential oils containing these aromatics are excellent ingredients for face cream perfumes. Excellent results may be obtained using some essential oils such as geranium, bois de rose, bergamot, sandalwood, lavender, patchouli and vetivert. Ylang-ylang oil is also an excellent ingredient and very stable in the alkaline creams in spite of the fact that it contains a small proportion of isoeugenol.

Some tertiary alcohols, such as terpineol and linalool, are very useful. Terpineol should be of the purest quality. It serves as a base for many perfumes and is excellent to cover the smell of lanolin and fatty ingredients. Linalool provides sweet, flowery and fresh effects to many compositions.

Many esters are excellent for face cream perfumes; *e.g.* rhodinyl acetate, rhodinyl formate, geranyl acetate, geranyl formate, amyl salicylate, isobutyl salicylate, isobutyl phenylacetate and methyl octine carbonate. Benzyl acetate should be of the purest quality and its rather sharp note can be improved by adding 10% of benzylphenyl acetate which imparts a new note to floral bouquets, particularly in rose, jasmin, hyacinth, magnolia, eglantine and neroli types. It has considerable fixative value. Phenylethyl carbinyl acetate has a strong note of ylang-ylang which is less sharp than that of methyl-*p*-cresol. If methyl-*p*-cresol is used it must be strictly pure and completely free from *para*-cresol. Phenylethyl carbinyl acetate and methyl-*p*-cresol should be used in very small amounts. Benzylethyl carbinol has a mild, very fine and floral hyacinth odour and is stable to alkalies.

Among ketones, ionones, methyl ionones and irones are very useful. They are highly stable and efficient perfumes.

High quality alpha-amylcinnamic aldehyde can be successfully used if the quantity is not too high: it should be just enough to obtain the necessary floral bouquet. Cyclamen aldehyde can be used as a replacement for hydroxycitronellol and dihydroxycitronellol.

The best fixatives for face cream perfumes are natural musk or synthetic cyclic musks, such as Versalide (Givaudan) and Exaltone (Firmenich). Good fixatives are also nitro-musks—ambrette, ketone and xylol, coumarin and methyl naphthyl ketone. When synthetic cyclic musks are employed they should be dissolved in a good solvent such as Deltyl—a brand of isopropyl myristate (Givaudan)—for incorporation into the composition.

In the six tested formulæ of floral type perfumes given in this article, the perfumes are stable, and will not produce discoloration or irritation. The ingredients should be mixed in the order named.

The perfumes containing solid ingredients should stand aside in a warm place until they have dissolved. All perfumes should be matured one month before use.

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GELATIN CAPSULES

(*Continued from page* 333)

and D capsules B.P.C., high-potency vitamin A capsules using natural or synthetic palmitate, high potency vitamin D capsules using calciferol B.P. or irradiated ergosterol, vitamin E capsules using various natural and synthetic tocopherols, and cod liver oil capsules B.P. A special product is nitroglycerin capsules with specially soft shells. Other products which are encapsulated by the process include bath oils, flavours, garlic oil and other spice oils, waxes and numerous formulations as solid-in-oil suspensions. Colour, size, potency and packing can be varied to requirements. Dry powders cannot be encapsulated, but the process is being continually developed for a variety of new products.

Seaweed. J. W. Cumming and Sons Ltd. have specialised in seaweed since 1895, and now have five extraction factories. Their leaflet describes some of the many applications of one of the principal weeds of commercial interest, Irish Moss, which is used as a stabiliser in cosmetics, pharmaceuticals and food.

Facts about Albright and Wilson describes very briefly the structure of this group and the activities of some of its larger manufacturing companies. Overseas operations are described.

Automatic control valves. A 50-page loose-leaf catalogue has been produced by the Magnetic Valve Co. Ltd. describing its products and services. Full details of standard-type MVC magnetic valves are given, together with information on valves available for special applications. Other pages deal with ancillary equipment, including MVC rectifier sets, thermostats, electrothermal links, pipe strainers, magnetic control switches and engine emergency cut-out switches. Three pages are devoted to general data on magnetic valve installation and service.

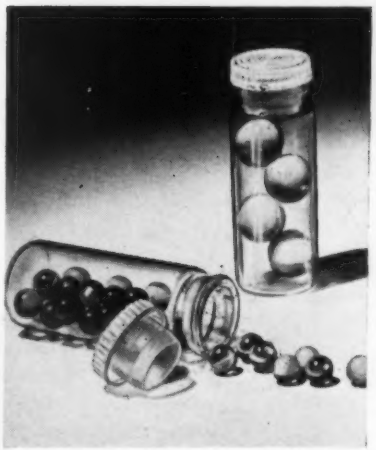
Seamless Gelatin Capsules

THE advantages of the seamless gelatin capsule have been increasingly appreciated by manufacturing chemists since it was introduced in this country from the Netherlands a few years ago. The sole concessionnaires in the U.K. for this process are B. and P. Laboratories Ltd., of Acton, London, W.3. In their compact factory they now have five machines with ancillary departments, including a control laboratory, and are now capable of turning out up to twelve million capsules a week.

The process is so simple that at first it seems impossible. It is an ingenious exploitation of natural phenomena which completely eliminates the need for moulds. In outline the machine works like this: Into a nozzle with concentric openings is fed simultaneously the substance to be encapsulated and molten gelatin. The gelatin emerges as a molten tube with the active ingredient in the centre. As the material issues from the nozzle natural surface tension causes it to form spherical drops. These fall into a bath of cold B.P. paraffin (approx. 3°-4°C.) which, of course, is immiscible with the gelatin and in this way the shells of the capsules begin to harden. The capsules are automatically ejected in a continuous stream into trays containing more paraffin, after which they are degreased. The final hardening takes place in a dehumidifying chamber of the air recirculating type. Then follows visual inspection of every capsule, after which they are packed in polythene bags which are placed in cartons sectioned to accommodate eight bags.

These are the pinciples of the process as originally conceived. In the production machines the formation of capsules is greatly accelerated by a device which repeatedly constricts the concentric flow, one constriction to each capsule. In this way machines can be made to produce up to 29,000 capsules per hour.

Capsules at the moment of formation. They issue from the concentric nozzle into a bath of cold paraffin B.P. Already the shells have begun to harden. Outputs of up to 29,000 capsules per hour can be achieved.



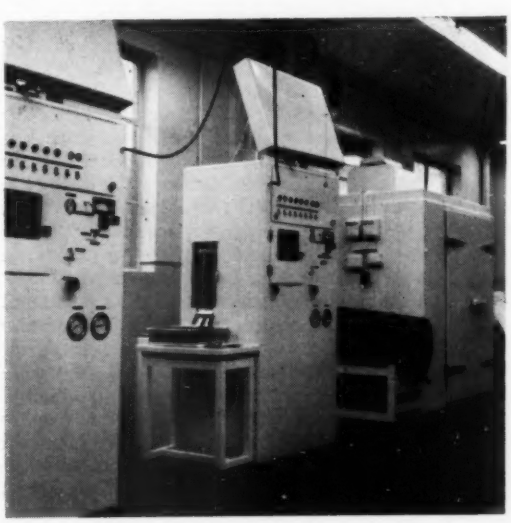
Examples of seamless gelatin capsules. They are perfectly spherical and can be made in sizes from 10 mg. to over 400 mg.

A great feature of the process is the saving of gelatin normally wasted as scrap matrix. Another is the ease with which the size of capsule can be changed. Merely by adjusting the flow rate of active ingredient the size of capsule can be varied over a range from 10 to over 400 mg. The process is so simple and, in its present stage of development, so foolproof that two or three operatives can supervise three times as many machines. Once loaded, a machine runs for four to six hours without attention.

Another advantage is that during the whole process of manufacture the capsules are immersed in paraffin except for the split second when they fall from the machine into the receiving tray. This excludes contamination without the need for expensive air conditioning. Accuracy of dosage is claimed to be within $\pm 1{\cdot}5\%$. A further economy in gelatin usage derives from the fact that the process permits the use of gelatin of lower viscosity and higher moisture content than usual. This quality of gelatin makes easily soluble and highly glossy capsules.

B. and P. Laboratories encapsulate clients' own materials and manufacture capsules to B.P. and B.P.C. standards. The range currently available includes halibut liver oil capsules B.P., vitamin A

(Concluded on opposite page 332)



An installation of the latest Globex mark 2 encapsulating machines for manufacturing seamless capsules.

Wetting Agents for Agricultural Sprays—I

By J. S. Stanley, PH.D.*

Wetters and spreaders have been added to agricultural sprays for many years to improve their efficiency, but it is only recently that detailed studies of the mechanism of their action have been made. Although there are little biological data on the performance of spray chemicals with and without added wetting agents, recent work, especially upon the mechanism of spray retention and the factors controlling run-off, has made it possible to lay down principles that can guide the formulator as to whether or not it is desirable to add a wetting agent to a particular formulation. The development of a wide range of commercial wetting agents, particularly the powerful dialkyl sodium sulphosuccinates and the unreactive non-ionic types, mean that there are now available wetting agents suitable for inclusion in almost any spray concentrate.

AS Moilliet and Collie[1] suggest, four effects may result from the addition of a wetting agent to a spray solution, these are:

1. A decrease in the droplet size of the spray.
2. An increase in the quantity of spray that is retained by the leaves on impact.
3. An increase in the spreading of the adherent droplets.
4. A change in the volume of spray lost by run-off.

These effects will be considered in more detail below.

The distinction between the terms "wetter" and "spreader" as used in pest control literature is rather obscure, so that the more general term "wetting agent" is used throughout this review.

Droplet size of the spray

Fan nozzles are usually used for ground crop spraying, since they are simple in construction and when properly mounted the amount of spray reaching the crop does not vary very much across the swathe. The pressure required to give a satisfactory spray with these nozzles is comparatively low, 20-40 p.s.i., so that comparatively simple pumps such as the gear pump or roller vane pump[2] may be used. Hollow and solid cone nozzles are used for high volume orchard spraying, since they are capable of throwing a jet of spray for considerable distances. Like the fan nozzles they are hydraulic, but require much higher pressures, around 300 p.s.i. for satisfactory operation. For very low volume orchard work air blast nozzles, in which the energy required to disintegrate the liquid is supplied by a blast of air at high or low pressure, are being used since they give the very fine sprays required. The construction of hydraulic spray nozzles is discussed by Westerman,[3] and the fundamentals of spray generation by Fraser, Eisenklam and Dombrowski.[4]

Disintegration of a liquid into a spray of small droplets causes a very large increase in the surface of the liquid. The energy required to create new surface is directly proportional to the surface tension, so that if a wetting agent which reduces the surface tension is added to the spray the pressure required to give a spray of the same fineness will be reduced, or alternatively if the same pressure is used a finer spray will result.

Surface tension also alters the spray distribution across the width of the area sprayed by a fan nozzle.[5] For instance, addition of *Teepol* to the spray causes an increase in the proportion of spray that falls in the centre of the fan. Although this will probably not have much effect upon the distribution of spray from a spray boom where the nozzles are usually arranged so that there is considerable overlap of the fans above the crop, wetting agents may alter the amount of spray deposited by laboratory pot sprayers in which only a single nozzle is used and the plants are placed directly beneath it. The correlation between the change in spray distribution and surface tension was not complete: addition of 0·2% of *Teepol* which reduced the surface tension of the solution from 72 to 34 dynes/cm. had only a slight effect upon the spray distribution, but increasing the concentration of *Teepol* to 1%, which did not alter the surface tension appreciably, caused the amount of spray deposited in the middle 6 in. of the fan to be increased by 40%.

During spray generation the surface of the liquid expands very rapidly, so that the speed at which the wetting agent can be adsorbed at the newly formed surface is very important. The surface tensions of freshly formed surfaces, dynamic surface tensions, are difficult to measure accurately, mainly because there is no really satisfactory method of measuring the age of a surface only a few milliseconds old. The most comprehensive work has been carried out by Addison and his co-workers[6] who studied the rates of adsorption of a series of aliphatic alcohols. No difference between the static (equilibrium) surface tension and the dynamic surface tension could be detected with alcohols having a shorter chain length than butyl. With *n*-amyl alcohol the time required to reach equilibrium was 0·023 sec. and with *n*-octyl alcohol, 0·052 sec. The rate

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of attainment of equilibrium increased with the concentration of the alcohol but decreased with the chain length. It is probable that the time required for the much larger and more complex molecules of commercial wetting agents to reach surface equilibrium is greater than this.

The dependence of spray pattern upon the concentration of *Teepol* in the range where equilibrium surface tension is approximately constant is explained by the fact that the dynamic surface tension of the solution during the break-up of the spray is more dependent upon the *Teepol* concentration than the equilibrium surface tension figures would indicate. The dynamic surface tension is, of course, also important when considering the effect of wetting agents upon the droplet size of the spray.

Spray retention

The leaves of certain plants such as peas, flax, fat-hen and knotgrass are not easily wetted by water, yet water can spread over the leaves of others, like beans, charlock and buttercup, in a continuous film. An extensive quantitative study of the factors that affect the wettability of a number of plants has been published by Fogg.[7] Some of his results are given in Table 1.

Table 1

Contact angle of water on leaves

Peony	73-98°
Water lily	37-60°
Charlock	28-104°
Laurel	65-81°
Broad bean	29-60°
Wheat	118-152°
Flax	98-140°

It will be seen that there is considerable variation in the contact angle among plants in any species, which Fogg shows to be due mainly to differences in the age and position on the plant of the leaves and to their water content, which varies according to the time of day. The cotyledons of flax, for instance, are much more easily wetted than the true leaves.

The effect of wettability on the retention can be seen from Table 2, also taken from Fogg's paper. The spray was applied by an atomiser.

It will be seen that the amount of spray retained by the wheat is less than one-third that retained by the charlock, and that the size of the droplets on the wheat is much smaller. The reason for the low

Table 2

Retention of water by wheat and charlock.

	Wheat	*Charlock*
Contact angle	130°	72°
Mean greatest diameter of droplets mm.	0·085	0·53
Mean volume of droplets mm.³	0·000294	0·025
Retention. mg./cm.²	1·50	5·12

retention of spray by the wheat in these experiments is that the small droplets of spray coagulate into larger drops which, because of the high contact angle, can roll off the leaf surface.

The spray used in this experiment was generated by an atomiser so that the droplet size would be much smaller than that from the hydraulic nozzles normally used for crop spraying. Brunskill[8] has studied the retention on pea leaves of droplets of the size more usually encountered in crop spraying (40-450 microns diam.). A stream of droplets of uniform size and velocity was produced by a vibrating blade whose tip passed through a pendant drop of the liquid under test. At each passage of the blade through the pendant drop a droplet was thrown out whose size could be controlled by the rate of feed of solution into the pendant drop. This ingenious apparatus allowed a study of what happens to a single drop when it strikes the leaf surface to be made, and it was found that droplets of water larger than 243 microns in diam. bounced off the surface leaving no detectable residue. Brunskill succeeded in taking photographs of these droplets bouncing from the surface of pea leaves and showed that on striking the surface the droplets were flattened into an unstable state where the area covered was much greater than that covered by an equivalent stationary drop. After this the droplet retracts violently and comes away from the surface with a pronounced oscillation. The picture appears to be similar to that of a soft rubber ball bouncing from a hard surface.

The proportion of droplets reflected from the surface decreases as the droplet size is reduced and below 93 micron diam. the drops are completely retained, probably because droplets of this size do not have sufficient kinetic energy to become detached from the surface.

Brunskill also measured the change of retention with surface tension using aqueous solutions of methanol and acetic acid. Reduction in surface tension caused a very great increase in the retention, which for 250 micron drops was complete below 41 dynes/cm. The rates at which methanol and acetic acid are adsorbed at the surface will be very great so that the static surface tensions quoted here will not differ appreciably from the surface tension of the solution during impact with the leaf.

The terminal velocity of 380 micron diam. droplets of water falling in air is 5·2 ft./sec. so that the time required for a droplet of this size to reach the crop from a nozzle at a height of 18 in. would be of the order of 0·25 sec. The surface is therefore comparatively old, so that even wetting agents that are fairly slowly adsorbed at the surface will have some effect on retention. On impact with the surface the droplet is flattened, resulting in a sudden expansion of the surface and reduction in the amount of wetting agent adsorbed per unit area; unless the rate of adsorption is very high there will therefore be a momentary rise in surface tension which will increase the tendency of the droplet to bounce. For this reason it seems unlikely that there will be any simple relationship between the tendency to bounce and the dynamic surface tension at any specific age, but that wetting agents in sufficient quantity, probably much more than the amount required to reduce the static surface tension to the critical value of 45 dynes/cm. will completely suppress bouncing.

Brunskill was unable to obtain bouncing from smooth water-repellent surfaces such as paraffin wax (contact angle 108°) or silicone-treated glass slides, and suggests that contact angles of the order of 140° are required before droplet bounce can be observed. These high contact angles, which are found when drops of water are placed on the leaves of pea and other unwettable plants, are not due to the presence of especially water repellent waxes in the leaf cuticle, but to surface roughness and to the inclusion of pockets of air between the leaf and water surfaces.[9]

In low volume spraying, where run-off does not occur, droplet bounce is probably the sole cause of the low retention that is observed when plants which are difficult to wet are sprayed. It is not to be expected that differences in retention as large as those found by Brunskill in the laboratory will be

obtainable under field spraying conditions, since sprays from hydraulic nozzles always contain a proportion of small droplets which will be retained by the leaves of unwettable plants. Very significant increases in retention are, however, to be expected under field conditions when wetting agents are added to the spray formulation.

In a series of experiments with peas grown on soil treated with sodium trichloracetate, which renders the leaves of the plants wettable,[10] increases in retention of dinoseb sprays of over 60% were recorded in all but one of the experiments and in two experiments increases of over 350% were observed.

The effect of droplet size upon the toxicity of M.C.P.A. sprays to a number of crops and weeds has been measured.[11] On peas, flax, linseed and barley, reduction of droplet size led to a great increase in toxicity. Similar effects were noted when weeds such as fat-hen and cornflower were sprayed. On the other hand, droplet size had no effect upon the toxicity of the herbicide to wettable weeds such as charlock and hemp-nettle, where retention is complete under all conditions. It has also been reported[12] that wetting agents increase the toxicity of 2:4-D formulations to lucerne. All these findings confirm the validity of Brunskill's experiments.

Spreading

Droplets retained by the leaves after spraying usually tend to spread over the surface. Wetting agents may be added to the formulation to promote this spreading and so increase the proportion of the surface that is covered by the spray deposit. Martin[13] and Evans and Martin[14] have measured the area of drops carefully placed on artificial surfaces and have found that good correlation is given by the equation:

$$A = \frac{k}{\gamma\ (1-\cos\theta_A)}$$

where k is a constant, γ the surface tension of the spray liquid and θ_A the advancing contact angle. Wetting agents reduce both the surface tension and contact angle and therefore promote spreading. Since spreading occurs comparatively slowly, there will be sufficient time for surface equilibrium to be reached and measurements of the static surface tension of the solution should give some idea of its spreading power, although correlation will not be complete since the advancing contact angle depends upon factors other than the surface tension of the solution. The equation also shows that if the advancing contact angle is zero spreading is unlimited.

Since the spray deposit dries out, there is a limit, in practice, to the amount of spreading that can occur, as spreading must stop as soon as the deposit becomes solid. More wetting agent than is required just to reduce the contact angle to zero will increase the rate of spreading so that a greater proportion of the leaf will be covered by the deposit before the water in the spray has evaporated.

Run-off

In high volume spraying (above 60 gal. per acre for ground crops) a considerable proportion of the spray solution runs off the leaves after spraying; the amount of this run-off is important since it determines the level of deposit remaining on the leaf. Evans and Martin[14] have shown that the level of the deposit increases to the point of incipient run-off and then decreases again to a constant level when larger volumes of spray are used. In most high volume spraying operations the volume required to give this incipient run-off is far exceeded.

Maximum retention is obtained at intermediate degrees of wetting.[14] If the contact angle is too high initial retention is low, but if it approaches zero the spray droplets coalesce into a continuous film of liquid which can drain off the leaf instead of remaining on the surface as discrete lenses. It would appear that wetting agents may reduce the level of deposit obtained during high volume spraying, especially when easily wettable leaves such as potato are being sprayed. If, however, unwettable crops such as flax or peas are sprayed, the quantity of wetting agent that is required to obtain good initial retention will usually be sufficient to give complete wetting out. Even when wettable crops are being sprayed wetting agents are often added where the evenness of cover, rather than high total deposit, is the first consideration.

Somers' recent work[15] on the effect of relatively high concentrations of wetting agents upon the level of deposit obtained when leaves are sprayed to well beyond run-off is therefore of considerable practical importance.

In these experiments wettable leaves were sprayed to well beyond run-off with Bordeaux mixture containing various wetting agents, and the level of the deposit in the centre of the leaves determined. Addition of 0·25% of dioctyl or dinonyl sodium sulphosuccinate reduced the amount of deposit remaining on the surface to less than half, while up to 1% of octyl cresol polyglycol ethers could be added without altering the amount of the deposit. Other wetting agents such as sodium lauryl sulphate or cetyl pyridinium chloride gave results intermediate between these two extremes. Work in progress by the writer and his colleagues in these laboratories indicates that this phenomenon is much more general in nature than has hitherto been expected and does not depend on any specific properties of leaves and Bordeaux mixture. Although no completely satisfactory explanation of these results has been given, they are obviously of very great practical importance, since the polyglycol ethers are very suitable wetting agents for agricultural spray formations.

Conclusion

It is clear from what has been said above that the effects which result from adding wetting agents to sprays are very complex, and that there is no single easily measurable property of a wetting agent that can be used to assess its likely performance in the field. The effectiveness will depend not only upon its wetting power determined from surface tension and spreading measurements, but also upon the rate at which it can be adsorbed at freshly formed surfaces. There is at the moment no simple method of determining this. The only satisfactory method of evaluating wetting agents is therefore by laboratory and field trials of the performance of the formulation.

In the second article Dr. Stanley will show how the results of the fundamental work described above may be applied to specific spraying problems and will attempt to assess the suitability of some of the many types of wetting agent now available for inclusion in spray chemical formulations.

(*References on page* 339)

COSMETICS and Toilet Preparations

By W. W. Myddleton, D.SC.

Emulsifying properties of natural and semi-synthetic gums • Detergents in toothpastes • A new titrimetric analysis for ethylene oxide in condensates • Propylene oxide for sterilising powders • Preservation of cosmetic emulsions

Emulsifying properties of natural and semi-synthetic gums

THE selection of an emulsifier or combination of emulsifiers from the now very considerable list of available materials has been greatly simplified, but not of course completely solved by the well-known hydrophile-lipophile balance or HLB system described in 1948 by Griffin.

Lists of emulsifying agents are now available, tabulated according to the HLB system.[1] The values recorded in such tables are derived in some instances from a long and tedious experimental procedure,[2] but generally by calculation, applying formulæ which are based upon either analytical data or composition and claimed to give an accuracy of ±1%; for example there are formulæ to deal with polyhydric alcohol fatty acid esters and with fatty alcohol ethylene oxide condensates.

No satisfactory calculation is yet possible in the case of non-ionic emulsifiers containing propylene oxide or butylene oxide, or some containing nitrogen or sulphur. Ionic emulsifiers also fail to fall in line because the hydrophilic portion of the molecule ionises and so increases its effect in the product. For such types of emulsifier the HLB must be determined experimentally and for this reason few of them appear in the published lists; only one cationic emulsifier has been evaluated.

A striking omission hitherto has been the group of natural gums such as acacia and gelatin and the semi-synthetic cellulose derivatives, which, while acting as emulsifying agents, contribute valuable demulcent, emollient, film forming and viscosity raising properties. An attempt has now been made to measure the HLB of such materials as these.[3]

Emulsions were prepared by shaking equal quantities of water and an oil, whose HLB requirement was known, with varied ratios of gum (on a dry-weight basis) and a synthetic non-ionic of known HLB. Because of disturbing viscosity effects at higher concentrations of gum the total emulsifier concentration of only 0·5% was employed, except in using gum acacia when the total concentration was maintained at 3%.

The optimum emulsifying ratio of gum to synthetic in a series was determined by observing the rate of phase separation. Beginning with the synthetic forming 0, 25, 50, 75 and 100% of the total emulsifier, the zone of optimum emulsification was found and further explored in that region of concentration using a new set of emulsifier mixtures with smaller differences between them. Thus in several steps the optimum is narrowed down to a very narrow range. A position is finally reached as in the following example:

Using liquid petrolatum, U.S.P. 1955, which requires an HLB of 10·5 for an oil in water emulsion, with gum acacia and Tween 20 (HLB 16·7), the best emulsification was obtained when 67·5% of the total emulsifier content was acacia on a dry-weight basis and 32·5% was Tween 20.

$$\text{The HLB of gum acacia} = \frac{10{\cdot}5-(16{\cdot}7\times 0{\cdot}325)}{0{\cdot}675} = 7{\cdot}5$$

A similar procedure using the same oil with Span 80 (HLB 4·3) and gum tragacanth gave optimum emulsification when the emulsifiers were in the ratio of 30% Span 80 and 70% gum tragacanth. The calculated HLB of gum tragacanth is 13·2 in these experiments.

Detergents in toothpastes

A detergent may be incorporated in a toothpaste either to control the texture and consistency of the paste or to produce a sudsing effect in the paste. In either case soap may produce an unpleasant soapy flavour which can be masked only by increasing the concentration of or altering the type of flavouring. Sodium lauryl sulphate endows the paste with sudsing properties at a lower concentration than soap and by a careful process of purification the taste of the sulphate may be reduced considerably.

Apart from the flavour of the detergent itself it has been widely reported that the flavour of citrous fruits and some beverages, for example coffee, acquire an unpleasant bitterness when tasted at breakfast shortly after brushing the teeth with a sudsing toothpaste containing alkyl sulphate. The use of a detergent blend to overcome this objectionable characteristic has been discussed recently.[4]

The blend is that of sodium lauryl sulphate with sodium coconut monoglyceride sulphonate. The latter, which predominates in the approved mixture, gives a more abundant foam than does sodium lauryl sulphate, has little flavour of its own and does not appreciably affect the flavour of foods.

Two syntheses of the sulphonate were described in a South African patent.[5] In one of these syntheses epichlorhydrin is made to react with sodium bisulphite in solution and form the monochlorohydrin sulphonate which is made to react with coconut oil soaps. In the second α chlorohydrin is heated with sodium sulphite to form sodium 1 : 2-dihydroxy propane sulphon-

ate. Coconut oil fatty acids convert this into the sodium coconut monoglyceride sulphonate.

The use of the blend of the sulphate and sulphonate in toothpastes is covered by an American patent of more recent date.[6] It is claimed that a small addition of the blend gives ample sudsing and allows of a reduction in the quantity of flavouring, so producing a pleasant and refreshing effect from the popular types of flavouring which give a sensation of hotness when present in a concentration to mask the flavour of sodium lauryl sulphate or soap. An example is given as follows:

	%
Di-calcium phosphate	43·155
Na monoglyceride sulphonate ...	0·750
Na lauryl sulphate	0·375
Water-glycerin elixir	53·000
Irish moss extract	1·500
Salt and sweetener	0·370
Flavouring	0·850

Titrimetric analysis for ethylene oxide in condensates

Absolute measurements of the ethylene oxide content of non-ionic surface-active agents can be made by cleavage of the ether linkages with hydriodic acid. The method is attractive because it is not necessary to know what the hydrophobe base of the material is. An estimation requires about three hours to carry out, so that, for purposes other than research, it is desirable to use other shorter methods which, however, require preliminary calibrations to be made with known samples. Noteworthy amongst these alternative methods is one in which the condensate is precipitated by addition of a hetero-poly acid and the precipitate treated for titrimetric or colorimetric estimation. Another alternative is the cloud-point method whose usefulness is limited to water-soluble compounds.

In the ester type of surface-active agent the ethylene oxide content can be calculated from the saponification and the hydroxyl values so long as the nature of the hydrophobe is known. On the other hand, condensates made from higher alcohols cannot be assessed by hydroxyl value, probably because of the presence of some glycols.

Greenwald *et al.*[7] estimated the ethylene oxide content by dissolving the non-ionic surfactant in dioxane containing benzene and titrating the solution with water to an end point at which turbidity appeared. The method is invalid for ester type condensates which, in any case, can be dealt with satisfactorily by the saponification-hydroxyl value method. The dioxane used should be purified and this is a difficult operation. The results vary from batch to batch of dioxane used unless the purification be rigorous. Moreover, dioxane must be handled with extreme care because of its poisonous properties.

These two difficulties are overcome by Weeks *et al.*, who replace dioxane by N-dimethyl formamide.[8] It is still necessary to purify the commercial grade and this is done by redistilling over calcium hydride at a pressure of 19 mm. mercury. The fraction boiling between 51° and 52°C. is collected for use.

In the analysis 1 gm. of sample is weighed into a 125 ml. Erlenmeyer flask. To this are added 25 ml. di-methyl formamide and 1·25 gm. of benzene. Temperature is an important factor and the flask is initially swirled and cooled in ice-water to 20°±1°C. The flask is removed from the bath and distilled water is run in from a burette in 2 ml. increments, swirling and cooling between successive additions to bring the temperature to 20°± 1°C. When a turbidity appears before swirling the increments are cut to 0·5 ml. and later to one drop. The titration is complete when, 1 min. after cooling and gentle swirling, typescript cannot be read through the turbid solution. The volume of water required to produce the turbidity is noted.

To establish calibration curves a set of condensation products must be obtained from the same hydrophobe base differing from each other by not more than 2 or 3 mol. of ethylene oxide. Once the calibration curves have been prepared an estimation can be completed in 20 min. As in the dioxane method ester type, condensates are not amenable to treatment by this procedure.

Propylene oxide for sterilizing powders

The dangers of bacterial and fungoid contamination of powders used in toilet and cosmetic products may be alarmingly increased by unsatisfactory storage in the warehouse, either by reason of dampness, dustiness or infestation, or through the use of unsatisfactory containers. It is thus likely that some of the few complaints of harmful effects resulting from the application of such materials as talc, kaolin, fullers earth and boric acid may be due to an avoidable infection acquired during storage or handling.

The sterilisation of a powder is always a matter of difficulty and given good conditions of storage and handling there is little need, as a rule, to introduce such a procedure. The most important case of all is baby powder, and this problem has been reviewed recently.[9]

The epoxides ethylene oxide and propylene oxide have been employed as sterilising agents for many years. In 1937 a United States patent[10] was granted for a process in which food, tobacco and other materials were treated in a closed chamber with ethylene oxide and sufficient moisture to convert it into ethylene glycol. Later the sterilisation of dry colloid materials such as gelatin and natural gums was carried out by preliminary vacuum treatment followed by exposure to ethylene oxide at a temperature of 110°-115°F. for 2½ to 3 hr.[11]

A modification in 1945 led to the application of ethylene oxide and propylene oxide to sterilisation after packaging.[12] The preservative was added to a foodstuff before sealing in some material, for example cellophane, which was permeable to the vapour of the preservative. In tests with cellophane all traces of the epoxide had disappeared in three days and sterilisation was satisfactory.

A patent was later granted[13] for the sterilisation by means of propylene oxide of powders such as baby powder packed in metal cans. Here the preservative cannot diffuse substantially from the container. Sufficient moisture is therefore added to the powder to react with the epoxide which is used at the rate of 1% to 2% of the damp powder. The sealed cans are stored at 70°-120°F. until the odour of epoxide has disappeared. Under the proper conditions this should take place in 1-15 days.

In a demonstration test, talc (95%) mixed with powdered boric acid (5%) and a little perfume was inoculated with an aqueous suspension of *B. subtilis*. The powder was packed to half fill a number of shaker cans. The powder contained 0·5% water, and 1% propylene oxide was injected into the can by means of a hypodermic syringe. The perforated caps were

hen closed and sealed with adhesive tape. These and a number of control cans without propylene oxide were stored at 120°F. for 15 days and tests were made at intervals on some of the cans during that time for sterility and odour. The samples containing propylene oxide were sterile after 1 day and free from the odour of the oxide in 7 days. The control samples still contained bacteria at the close of the test in 15 days.

The effect of moisture and propylene oxide upon the flow of the powder is important. Presumably different conditions will apply to different powder mixtures, but in the case under discussion free flow is maintained so long as the moisture content is 1% or less, even when the propylene oxide may be as high as 5%. The effect of epoxide upon perfume may call for consideration.

Preservation of cosmetic emulsions

It is well known that spoilage by moulds and bacteria is much more frequent in oil-in-water emulsions than when the oil is the continuous phase. It is often found that in the water-in-oil type the growth of living organisms can be attributed to the presence of contaminated foreign bodies in which the organisms find nutriment, or to the separation of an aqueous layer or film at the air surface in contact with the glass of a container, or resulting from condensation in the cap of the container.

In the o/w type the organisms may find nutriment in the aqueous phase, and here the presence of a preservative is vital. Again it must be emphasised that the influence of the wad may be of great importance.

An important discussion of the general problems of preservation of o/w emulsions has been presented by Tice and Barr[14] and the novel points may be summarised as follows:

Design of experiments

In designing experiments to investigate the effectiveness of preservatives it is not generally realised that the type of organism, its strain and also the numbers of organisms introduced as contaminants are all important factors. An example given relates to a rather different type of product, namely an ophthalmic solution. The Gram-negative bacillus *Pseudomonas aeruginosa* can cause ulceration and blindness if present in an eye lotion. The authors describe an investigation on the use of the antibiotic polymyxin B sulphate, the only successful preservative they had found. As a final check 21 different strains of the organism were collected from various laboratories and hospitals, and of these one was unaffected by 2,000 units per ml. of the preservative, whereas all the others were killed by 500 units per ml. This kind of effect can occur in the preservation of a cosmetic product.

The number of organisms introduced in experimental contamination may be sufficient to outweigh the amount of preservative added and will affect the chance of introducing a resistant strain or one which can adapt itself to an unfavourable environment.

Experiments have shown that if the contamination of an o/w cream be high no known preservative, with the exception perhaps of the phenyl mercuric salts, can be relied upon to inhibit organic growth. With a small amount of infection some but not all of those creams containing esters of *p*-hydroxy benzoic acid as preservatives may show signs of bacterial or fungoid growth. Whether any spoilage develops may depend upon the number of samples put under test. In some cases, with particular creams, manufacturers have got by satisfactorily even in the presence of non-ionic emulsifiers which are epoxide condensates by using only esters of *p*-hydroxy benzoic acid.

The authors have found that sorbic acid at a concentration of 0·2% is successful in cases where the ester preservatives are not completely effective, and that hexylene glycol at a concentration of 3% or in admixture with sorbic acid is also effective. Even with these preservatives there is a limit to the amount of infection which can be tolerated, and extreme care must still be taken in the avoidance of contamination in both raw materials and finished product and at all stages in processing.

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Esrolko Spécialités. Esrolko Ltd., of Dubendorf, formerly Chemical Works Flora, have issued a price list of some of the compounds which they offer for the cosmetics and toilet preparations industries. The company's main activity is the production of special compounds to meet specific requirements. Sole U.K. agents are Jacobsen van den Berg and Co. (U.K.) Ltd.

The B. B. & G. Group. A new brochure gives details of the wide range of chemicals and other materials which Bush, Beach and Gent Ltd., and other companies in the group, supply.

DETERGENTS and Detergency

By Leon Raphael, M.SC., F.R.I.C.

Sales • Bactericides for soap • Polyglycols • Detergent bars • Perfumes Foam • Micelles • Adsorption • Carboxymethyl cellulose Radioactivity • Analysis

Detergent sales

ALTHOUGH detergent sales continue to rise, the rate of growth has been retarded. In the United States, the total usage of soaps and synthetics has remained fairly constant at about 1,000 million lb., as active ingredient, per annum, but synthetics have continued to occupy an ever-increasing share of the market.[1]

Table I

Year	% Synthetics in total market
1952	35
1953	45
1954	52
1955	60
1956	65
1957	70

During the past year the total sales of soaps and syndets increased by 3% over the previous year's tonnage, while dollar value increased by 8·4%, indicating higher prices of products. The largest rise in sales has been in the field of nonionics, due to increasing popularity of liquid detergents, the sales of which rose by 31% in quantity. This has, however, been achieved with considerable price reductions because of growing competition. Despite the continual replacement of soap by synthetics, toilet soap bars are still popular and their sales have actually risen by 4·5% despite a price rise reflected in a dollar value increase of 9·4%.

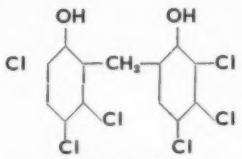
The rise of soap and detergent sales is the result of a higher standard of living, but manufacturers consider that the increased demand does not keep pace with the rising national income. Over the next 10 years, it is believed, consumption of soaps and detergents will increase by 50% over the present figure, but if the social habits of people improved accordingly as they moved into the higher income groups, this consumption rise would be even greater. Despite increased sales and higher prices, advertising costs are also rising, so reducing the profit margin.

Soap in antiquity

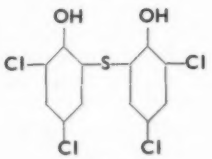
The ancient Greeks and Romans, who washed without soap, would have been shocked by the discovery that even before their time soap was successfully manufactured and used. Excavations in Sumeria (modern Iraq) have recently disclosed that soap was made there nearly 5,000 years ago.[2] Clay tablets quote recipes for potassium soaps used in fulling and washing cloth. One part of oil was treated with five and a half parts of " potash " (actually, crude potassium carbonate) to produce the soap. This process continued to be used in the Middle East and Europe until the last century. The ancients were familiar with the recovery of glycerin as a by-product of soap production and knew the process of " salting-out " from the lye. The Sumerian tablets also describe the compounding of medicated soaps. Perfume, of course, still plays a large part in the sale of soaps among eastern peoples. Indian soaps, today, contain up to 3% perfume, although their toilet bars are among the cheapest in the world.

Bactericides

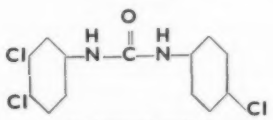
Chlorinated phenols are the most successful bactericides for incorporation into soap bars, but the greatest problem encountered is their insensitivity to light, causing discoloration of the soap during storage. The best known compounds of this type are hexachlorophene and bithionol, both of which have a high-bactericidal power. Their light sensitivity has led to a search for other suitable materials, and recently trichlorocarbonilide (T.C.C.) has been described and claimed to have the desired properties.[3] T.C.C. is insensitive to light and forms no complex with the metallic ions present in water. Its oral toxicity is low and it causes no skin irritation. Its high degree of toxicity to positive organisms on the skin has been observed on several subjects over prolonged periods. At a concentration of 2% T.C.C. in soap, the bacterial count on human skin was reduced by over 95% within a few days. In this respect T.C.C. is slightly better than the above-mentioned bactericides.



Hexachlorophene



bithionol



trichlorocarbanilide

Fatty acids

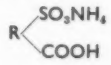
The recent progress made in the distillation of fatty acids has led to increased interest by small soap manufacturers in the possible replacement of oils and fats by the pure acids as their starting materials. Despite the higher prices of these materials, superior products are obtained which may be blended to meet specific requirements.[4] Advances in fat-splitting processes have led to the production of high-grade fatty acids resulting in easier and faster soap production with accompanying savings in fuel and labour costs. Equipment is also less expensive and glycerin recovery is eliminated. The small soap manufacturers can still vary the soda/potash ratio or produce individual soaps of sodium, potassium or ethanolamines. In 1956 about 10% of American fatty acid

production went into synthetic detergent manufacture (fatty acid esters of polyglycol, sorbitol or sugars), while the soap industry utilised about half this quantity. Because of their high foaming power, coconut acids with a high concentration of lauric acids are utilised in liquid soap manufacture. Unfortunately, they are skin-irritant, but this can be reduced by incorporating higher fatty acid soaps. The rejects from the distillation of narrow cut acids are utilised with syndets for floor-cleaning materials. Fatty acid liquid soaps solubilise phenolic germicides and pine oil used as the perfume to make satisfactory disinfectants. Other outlets for the "pure" fatty acids are in powdered hard soaps, waterless hand cleansers and shaving creams.

Detergent bars

The latest competitor to the toilet soap bar is the synthetic detergent bar and, today, four such syndet bars are sold on the American market. The advantage of a bar form of soap has been easily recognised as the most suitable for ease and convenience of handling and it was natural that attempts would be made for the syndets to exploit this popular field. The syndet bar is faced with many processing difficulties and cannot be manufactured on conventional soap bar equipment. Public prejudice towards the syndet bar is due to the different feel left after washing the skin. In addition, they have the disadvantage of higher water solubility than soap and are rather more expensive to produce. These difficulties can, to a large extent, be overcome by correct formulation.[5] Tallow derivatives are most suitable as they resemble soap in many of their properties. Sulphonation of tallow fatty acids is achieved by SO_3 treatment and two groups are available for neutralisation with alkali. The formula of such products will be of the type

and one or both of the hydrogen atoms may be replaced by sodium, potassium, ammonium or triethanolamine groups. The sodium and ammonium salts of the same sulphonated tallow acid differ considerably in solubility and surface active properties such as wetting, foaming and detergency as well as general appearance. The acid ammonium salts



are brittle and have low solubility in water with poor foaming characteristics. On the other hand, the triethanolamine salts are too soft and too water-soluble, while sodium and potassium salts have a limited solubility. Since the sulphonated fatty acids are dibasic, disodium or sodium-ammonium salts are possible and salts containing two metallic ions are most suitable. (See Table 2.)

Table 2.—Some properties of sulphostearates

	Water solubility at 30°C. g/100 ml.	Foam height (0·25% solution) mm.
di-ammonium	0·05	210
triethanolamine	>20	190
sodium-ammonium	0·1	210

The best results were obtained from a syndet bar of this formula:

72 parts sodium—acid salt.
8 parts sodium—triethanolamine salt.
20 parts sodium—ammonium salt.

Such a mixture gives a bar with attractive appearance having a smooth surface, suitable hardness and solubility, readily producing a rich lather.

Closely allied to the detergent bar is the "combination" bar containing both soap and syndet. The incorporation of nonionics into soap was studied for some years, but the difficulties encountered destroyed interest in the subject. More recently, however, the addition of 2 to 5% nonionic to soap has been shown to offer many advantages.[6] It improves detergency, foaming power, translucency, texture and homogeneity and reduces brittleness, tendency to cracking and flaking. The retention of good colour and odour during storage is also improved by the presence of nonionics which counteract rancidity. The usage of the soap becomes more economical in hard water due to the lime soap dispersing properties of nonionics and incorporation of other additives is facilitated during manufacture, *e.g.* carboxymethyl cellulose, antioxidants, super-fatting agents, germicides and deodorants.

Polyethylene oxide resins

Polyglycols with mol. wt. up to 20,000 have been manufactured and used widely in the cosmetics and allied industries for some years. These polymers are made by reacting ethylene oxide with glycols under pressure in the presence of an alkali catalyst and are formed as white water-soluble waxes. Recently such polymers have been produced catalytically with much higher mol. wt., between 100,000 and 4 million.[7] Instead of being waxes, they are better described as resins. They are soluble in water, increasing the viscosity of the solution considerably at very low concentrations. They are insoluble in anhydrous alcohols, in aliphatic hydrocarbons and in glycerine. One great advantage of these resins is that their aqueous solutions can tolerate large concentrations of electrolytes which reduce the viscosity. Their aqueous solutions can also tolerate a certain amount of non-solvents. For this reason, the resins are soluble in aqueous alcohol. Non-adhesive films of the resins are cast from solutions, but when blended with other resins such as dimethyl hydantoin formaldehyde (DMHF) an adhesive film is produced. In this form the "polyox" resins are used in hair sprays. Their poor solubility in alcohol, however, necessitates the use of methylene dichloride as a solvent and methyl chloride/*arcton* mixture as propellant. (*Arcton* is the trade name of fluorinated hydrocarbons.) Such a mixture is non-inflammable. Unlike the lower mol. wt. polyglycols, these resins are non-hygroscopic, which makes them more desirable than other resins in hair-sprays. Toxicological studies, so far, indicate that the "polyox" resins are perfectly safe for use in cosmetic and toilet preparations. They are compatible with anionics, including soap and cationics, but are not compatible with nonionics based on ethylene oxide. They may be used with sugar esters. At low concentrations they increase the richness of the lather of synthetic detergents, but destroy the foam produced by soaps, with the exception of triethanolamine soaps. The "polyox"

resins impart high lubricating properties to detergent solutions and improve the feel and lather on the skin and hair. These enhancements offer possibilities in formulating shampoos based on cheap anionics such as alkylaryl sulphonates, since they counteract the drying effect and also improve the properties of detergent bars.

Spray-dried perfumes

The spray-dried form of detergent is convenient to handle, has low density and is readily soluble in water. The addition of liquid perfume to the spray-dried detergent powder is uneconomical, since half the perfume is lost by evaporation before the product reaches the consumer. Very little progress has been made in the search for a suitable spray-dried powder incorporating the perfume, although one British company discovered the basic process for making powdered flavours as early as 1932. However, the retention of smell is a different problem from that of taste. Perfumes are dried at a much lower temperature than detergent slurries are sprayed. The process of spray-dried perfume production has been recently described,[8] whereby the perfume is incorporated in a stable emulsion of suitable viscosity for pumping and spraying. By this means, each small droplet of perfume forms a capsule encased by the gum of the emulsion, preventing volatilisation when the water in the medium evaporates. The evaporation of the water causes a cooling effect so that the temperature inside the capsule is much lower than that of the drying chamber. The perfume is thus sealed into the dried powder and is only released when the product dissolves in water. This process has been recommended for chlorine - type cleansers.

Foam

Most standard foam tests are carried out in water in the absence of soiling-matter, but a true evaluation of foaming power can only be done under conditions which simulate domestic washing operations. A recent paper[9] has described such tests in which alkylolamides, 97% true amide, have been evaluated. In one test, foam is produced by an egg-whisk type of stirrer, the stirring being then continued at a slower rate, while the stability of the foam is observed. In the presence of soil, the foam breaks down more rapidly. The procedure is to stir at high speeds for 30 sec. to produce foam, after which the stirring is continued a further 30 sec. at half the speed. This paper compares the foaming ability of a solution of dodecyl benzene sulphonate with one in which 10% of the active anionic is replaced by the alkylolamide. In the latter case the residual foam is higher. Lauric ethanolamide is superior as a foam booster to the commercial coconut acid ethanolamide. A second test method described is to pass a stream of air through a sintered glass bubbler into the detergent solution. The foam so produced impinges on a nylon web and is broken. The flow of air is increased to build up more foam and counteract the destructive action of the nylon web. The rise of foam produced by a given air rate is balanced by the breaking action of the nylon web so that the foam height may be used for comparative measurements. A greater surface of nylon web is required to break the more stable foams. As with the first test, the addition of alkylolamides to an anionic boosts and increases the stability of the foam. The commercial coconut acids contain 45% lauric acid, and although cheaper are less economical than lauric acid for detergent formulations.

The mechanism of foam boosting by additives has been discussed recently.[10] Some experiments have been made in which the change in critical micelle concentration (C.M.C.) of the detergent solution has been observed. The well-known classical procedure was to observe changes in electrical conductivity of the solution, a sharp change in the curve being indicated. A simpler procedure is to use certain dyes which change as the C.M.C. is approached. Additives which lower the C.M.C. of a surface-active agent enhance foam stability. Compounds with unbranched chains equal in length to that of the detergent molecules are most efficient in this respect. Sodium decylsulphate has its C.M.C. halved by the addition of a straight-chain glycerol ether with 10 carbon atoms, but the branched-chain ether of the same mol. wt. has little effect on the C.M.C. of the anionic. The benzene nucleus is equivalent in hydrophobic character to a straight chain of 4 carbon atoms and the C.M.C. of octyl benzene sulphonate (equivalent to C^{12}) is lowered to the greatest degree by lauric ethanolamide, shorter or longer chain amides being less effective. The addition of 16% LEA reduces the C.M.C. of the anionic to nearly half its original value, but further additions do not reduce the C.M.C. more.

Micelles

It is suggested that mixed micelles are formed between the additive and detergent to produce a lowering of the C.M.C. The formation of mixed micelles, however, follows a different mechanism to that of solubilisation of hydrophobic materials, such as oleic acid, which destroys foam. In this case the micelles are swollen by solubilising the oleic acid. This was revealed by X-ray diffraction. Micelles are composed of several detergent molecules formed into a sphere with the hydrophobic heads pointing towards the centre. Free unattached molecules (" gegenions") surround this nucleus, loosely attached to it. This outer layer is known as the " palisade " layer and it is into this low density area that additives are absorbed by hydrogen bonding without swelling the micelles. Hence, the similarity of chain length to the detergent molecules and the presence of hydrogen bonding groups are essential characteristics of the foam boosting additive. The work done in absorbing the additive into the " palisade " layer is given as $\pi\sigma$, where π is the pressure acting on the micelle surfaces and specific to the detergent solution, and σ is the surface area of the additive molecule. Branched-chain molecules have a greater surface area than the straight-chain molecules and hence more work would be required to absorb branched-chain additives. This absorption of additives such as LEA into the " palisade " layer results in easier packing, a lower surface tension and higher surface viscosity, all of which properties contribute towards foam stabilisation.

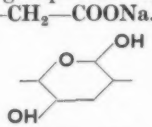
Adsorption

Critical micelle concentration also affects the adsorption of detergents on textile fibres and on soil. In detergent solutions, below the C.M.C. a suspension of carbon filters readily, the carbon being retained on the filter paper. Above

the C.M.C. of the detergent solution the carbon particles are solubilised by the micelles and pass through the filter paper. The C.M.C. is affected by inorganic salts as well as by organic additives and such salts affect the soil suspending powers of anionic detergents, absorbing the soil particles into the micelles. The adsorption of detergents on cotton is also affected by inorganic builders. Sodium sulphate and to a lesser extent sodium pyrophosphate increase the adsorption of dodecyl benzene sulphonate on textile fibres. This latter adsorption is due to unassociated ions of detergent not attached to the micelles. When these are removed from the solution to the surface of the fibres, the " gegenions " surrounding the micelles are freed and move into the bulk of the solution to replace those ions removed by adsorption. This, in turn, causes a breakdown of the micelles, some ions passing from the micelle nucleus into the " palisade " layer to establish equilibrium. The rate of micelle dissociation is related to the rate of adsorption. When inorganic builders are absorbed into the " palisade " layer of micelles, they distort the " gegenions," increasing their rate of dissociation. By plotting a graph of builder concentration against sorption an exponential curve is obtained. The surface areas of the soil or the fibres play their part in the adsorptive action.[11]

Carboxymethyl cellulose

Among the well-known builders in detergent compositions is carboxy methyl cellulose. Its particular property is that of a soil suspending agent and many theories have been proposed to explain this action. A recent paper[12] has reported experimental work to observe the behaviour of this polymer during the detergent operation. Carboxy methyl cellulose is a polymerised glucose in which some of the hydroxyl groups are replaced by $-CH_2O-CH_2-COONa$.



glucose unit

Each glucose unit of the polymer (cellulose) has two hydroxyl groups available for substitution and the degree of polymerisation D.P. (*i.e.* the number of glucose units in a molecule of the polymer) and the degree of substitution of the hydroxyl group D.S. influence the character and properties of the product. Hence a number of different grades of carboxymethyl cellulose are available. Generally, it is found that with a higher degree of polymerisation (*i.e.* a higher mol. wt.), the more efficient its soil suspending properties. Although the viscosity of aqueous solutions increases with increasing mol. wt., there is no connection between viscosity and soil suspending power. Carboxyl-methyl cellulose is a colloidal electrolyte in which the anion has a high electro negative charge and a mobility in very dilute solution similar to that of sodium ions. It is not surface-active, since it does not contain any hydrophobic groups. In concentrations as low as 0·001 to 0·003% carboxymethyl cellulose is an effective soil suspending agent, but to be superior to soap in this respect the required concentration is 0·005% Other protective colloids do not have soil suspension properties and the mechanism has therefore been explained as an adsorption. One theory is that the polymer molecules are adsorbed on to the soil particles, but this does not explain the action of the detergent. Alternatively, the carboxy-methyl cellulose may be adsorbed on to the textile fibres. The large size of the polymer molecules and the elongated structure would suggest this as a possibility. The high electro negativity of the fibres attracts the electropositive ends of the carboxymethyl cellulose, the negative ends pointing towards the suds. Observations by means of the ultraviolet fluorescent microscope indicated that the carboxy-methyl cellulose molecules are not adsorbed on to the textile fibres. On the contrary, the first theory is supported, namely, the carboxy-methyl cellulose molecules surround the dirt particles preventing their redeposition. In effect, the dirt particles are occluded by the polymer molecules. Very little adsorption of carboxy-methyl cellulose on textile fibres occurs and this was further proved by the use of radioactive isotopes.

Radioactivity

Radioactive tracers have been used to observe the efficiency of detergent action, and the high standard of cleanliness required in the food industries is one example of such an application.[13] This procedure has been utilised to study the efficiency of cleaning dairy utensils by adding to milk a radioactive isotope of calcium (Ca^{45}) in calcium chloride. An exchange takes place between radioactive calcium and the normal calcium in the milk, and the residue deposited on the utensils may be measured by a Geiger counter. After the detergent operation, the decrease in radioactivity of the unremoved residues measures the efficiency of the detergent.

The most effective preparation to remove milk residues from utensils was found to be one containing equal parts of anionic and nonionic detergents. Nonionics alone or predominating in the mixture were less efficient. Because of bactericidal properties of cationics, they are often used in conjunction with nonionics for cleaning dairy equipment. Such a composition would be more expensive and presumably less efficient than the anion/nonionic mixture.

Analysis[14]

Dodecyl benzene, commonly known as " alkylate," is the starting material for the most widely used detergent, dodecyl benzene sulphonate. It is made by condensing propylene tetramer on to benzene in the presence of a Friedel Craft catalyst ($AlCl_3$), sulphuric acid or H.F. The propylene tetramer contains other polymers of propylene and the resulting alkylate contains side chains of different length. The mol. wt. of the final product may not correspond to the theoretically expected value, and without knowing the true mol. wt., chemical analysis becomes difficult. The commercial product contains sodium sulphate, water and neutral oil. The oil contains unreacted alkylate, sulphones, dialkylation products, but is usually not more than 1% of the product. A complete analysis of the oil can only be done by ultraviolet or infra-red spectroscopy.

When the product (D.B.S.) is extracted with alcohol, the solution is evaporated as far as possible and diluted with water. This aqueous solution containing the anionic is made just acid with hydrochloric acid and a complex is precipitated by addition of benzidine hydrochloride. This precipitate is filtered and washed with *n*-pentane and dried at 100°C.

(*Continued on page* 347)

Packaging and Bottling Machines

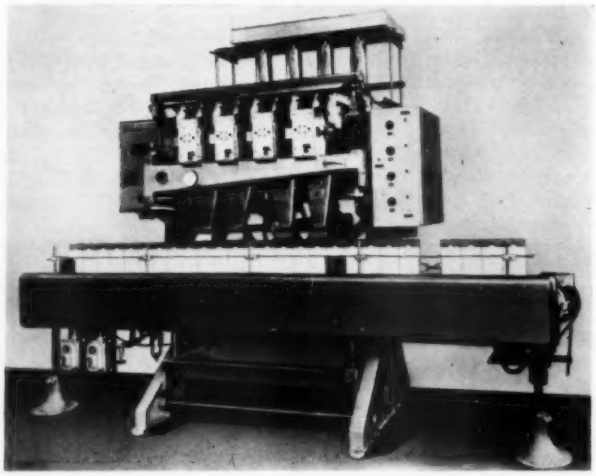
Pneumatic Scale (England) Ltd. has been formed to manufacture and market the complete range of Pneumatic Scale packaging and bottling machinery.

Pneumatic Scale machines have served the packaging industry since 1895, when the company was founded in Quincy, Mass., U.S.A., by William H. Doble. Since then over one hundred types of machines for the packaging and bottling industries have been designed. Many of them are fully automatic and enable outputs to be obtained of up to 300, cleaned, filled, capped and labelled containers per minute.

These machines will be made at the works of Vickers-Armstrongs (Engineers) Ltd. The range will include automatic packaging machinery to handle most types and sizes of cartons and other containers.

The packaging equipment will include the *Velocitron* high-speed packager and the *Rotapax* continuous motion packing machines, the *Pneumatron* net weighers, volume fillers, sealers and top closures, also *Duplex* heat seal and *Rotorex* pouch making and filling machines; dustless power fillers for all powder products, the *Duo-Vac* and *Vacuflow* powder drum and bottle fillers; for the liquids, semi- and fully automatic inverted air cleaners, including the high-speed *Pneumaclean* for open-mouth containers, gravity and vacuum fillers, *Samco* straight line and *Pneumacap* rotary capping machines with sterling cap feeder and air chucks for plastic and metal pre-threaded caps, simplex, duplex and direct transfer labellers to cover most types of labelling.

Sales and servicing of the British and American built equipment will be carried out by Rockwell Pneumatic Scale Ltd.



Four-head net weigher, one of the Pneumatic Scale machines to be made in Britain.

Level Controller

The Fielden Tektor Minor level controller has been designed to work accurately and consistently with virtually no attention.

It incorporates many of the design features of the higher priced models. They include an easily adjusted, calibrated set-point control; triggered, positive relay action; a quick release chassis for ease of installation; rugged terminal blocks; long life indicator lamps; and fail to safe high or low level.

Argon Chromatograph

The introduction of the argon chromatograph by W. G. Pye and Co. Ltd. marks a further advance in the technique of gas liquid chromatography—making possible sensitivities some 100,000 times greater than previously attainable.

Conventional systems, employing thermal techniques, depend for stability and reproducibility upon extremely accurate control of pressure, flow and temperature of both column and detector. According to Pye effects of these variables upon the argon chromatograph are so insignificant that the degree of control is set solely by the column requirements.

The Pye Argon chromatograph.

The insertion of minute samples in the order of 0·1 microlitre to 0·025 microlitre by use of a micro-pipette is simple: there is no overloading of column and efficiencies of the order of 1,000 theoretical plates per ft. length of column are obtained.

Sensitivity range is stated to be approximately one part component in 2×10^6 to 2×10^3 carrier gas (argon) for full-scale deflection on the recorder. The limit of detection is one part of component in 2×10^8 of carrier gas.

The detector is essentially a column surrounded by a heater in the end of which is the detector cell. The outlet from the cell is connected to a soap bubble manometer for quick and accurate check of flow rate. These items together with the temperature control facilities are mounted on a floor-standing cabinet. On the sloping panel are the switches for selecting temperature and for providing quick warm up.

A separate bench-mounted cabinet houses the recorder and the amplifier/power unit. This unit supplies a high voltage to the detector cell, and also amplifies the changes in current produced by the passage of components through the cell

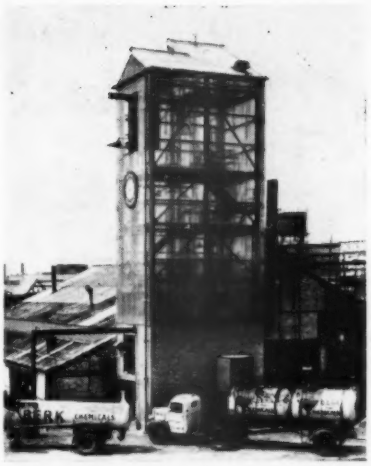
providing an output for a conventional recorder. Controls are provided to alter the voltage applied to the cell, and to adjust the overall sensitivity as required.

A wide variety of uses is foreseen for the argon chromatograph, including the checking and monitoring of chemical processes, oil refining, and the manufacture of foodstuffs, synthetics, perfumes, etc.

Plastic Tower for Chemical Process

A 65-ft. tower has been erected at the works of F. W. Berk and Co. Ltd. to house a difficult remote-controlled chemical process. The tower is made of a steel angle frame with an outer sheath of corrugated, transparent *Cobex* (rigid vinyl) sheet manufactured by BX Plastics Ltd. The sheeting is transparent amber in colour, giving an attractive effect at night when the tower is lighted internally. The corrosion-resistant properties of Cobex make it more suitable for this type of work than corrugated iron or corrugated asbestos.

The sign mounted on the front of the tower is also made from the same rigid vinyl sheeting in the yellow and black colours of F. W. Berk and Co. Ltd.



F. W. Berk and Co. Ltd. have erected this 65-ft. tower at their works to house a remote-controlled chemical process.

Vibro-Energy Grinder

A new vibro energy mill gives fine grinding with close control by high-frequency small amplitude vibration. It is the joint work of William Boulton Ltd. and W. Podmore and Sons Ltd.

The entire weight of the chamber and its contents is supported on high tensile steel springs, which eliminates the need for heavy bearings. The starting torque is low, consequently a direct on starter can be used and clutch and gearing become unnecessary. A minimum of maintenance is therefore required. Heat, which is always generated during grinding, can be dissipated through the top of the container, an important factor in the grinding of organic materials which tend to coagulate with excessive heat.

The mill works on the principle of applying small forces at high frequency in conjunction with a special grinding media.

The working volume of the mill is at least 95% of the grinding chamber and the space available for grinding is the volume of the interstices between the media. In more than 12 months' continuous use on a mill the makers claim that it has not been necessary to add to the original quantity of media, called alorite, a hard abrasion-resistant alumina body, cylindrical in shape, chemically inert and resistant to attack by acids and alkalies. Due to its hardness it wears slowly. Its high density enables wet grinding to be carried out at a much higher slip viscosity, using less water and reducing the drying-out time of the product. The mill will work equally well with steel balls if the material is not susceptible to metal contamination.

A valve is fitted at the bottom of the vessel for running off the ground product. The mill can be run whilst discharging, thus facilitating the handling of thixotropic materials. It is also practicable to draw off test samples without stopping the machine.

A range of six machines, each in two sizes, is available for both wet and dry grinding. Mills can be arranged for batch or continuous grinding in open or close circuit.

This new mill applies small forces at high frequency in conjunction with special grinding media.

Liquid Dosing

It is sometimes required to inject one liquid into another under low pressure at a constant mean rate. An apparatus for doing this has been devised by the Water Pollution Research Laboratory. It comprises a cylinder containing a free piston and a valve system operating at predetermined intervals of time to allow liquid from a pressurised source to pass alternately into opposite ends of the cylinder to displace the piston and discharge liquid from the other end. Definite volumes are then discharged in regular sequence at a predetermined time rate. The valves are actuated in pairs consisting of the inlet to one cylinder end and the outlet from the other and comprise a short length of tube such as P.V.C. nipped by a spring-loaded arm and opened, *e.g.* by an electromagnetic actuator. The valves are arranged so that each pair closes not later than the other opens to avoid by-passing. The pressurised supply is obtained by an automatic electric pump as used for fuel of a motor car. The timing device is a clockwork time switch operating *e.g.* at ½ sec. intervals, the effective intervals being varied by a cascade of relays and selector switch or equivalent electric control. The cylinder may be of transparent plastic such as Perspex. A switch causes all valves to open when the apparatus is to be washed out. The apparatus has been used for injecting radioactive tracer solution into a liquid stream for flow measurement. It is the subject of British Pat. Appn 35516/57 (G.E. Eden).—From the *N.R.D.C. Bulletin*, (12), 58.

For more information about the plant and equipment described, please use the coupon on page 360.

Organo-Metallic Compounds

Prof. Ziegler at Liverpool Symposium

ABOUT 150 chemists from industry and universities recently attended a symposium on Organo-Metallics at the College of Technology, Liverpool. Interest was chiefly centred on Prof. K. Ziegler, Director of the Max Planck Institute, Mulheim, who gave an account of his recent work on aluminium alkyls and played an active part throughout the proceedings, making valuable contributions to discussions following other lectures.

The symposium was organised by Dr. E. London, one of the staff of the College of Technology (now Development Manager, Lederle Division of American Cyanamid), assisted by his colleagues, Dr. H. Bradbury and Mr. C. B. F. Rice, who presided over the different sessions. Dr. K. S. W. Sing, head of the chemistry department, opened the course with a welcome to the lecturers and audience. Dr. London thought it appropriate to receive Prof. Ziegler in Liverpool during the centenary year of Max Planck's birth.

Prof. Ziegler is internationally famous for his discovery of the low-pressure polymerisation of ethylene catalysed by aluminium alkyls. The mechanism of this process is not yet completely understood, but much information has been gained in recent years. The polymerisation of ethylene proceeds by stepwise addition to the aluminium alkyl which then dissociates to give an aluminium hydride. Aluminium alkyls may be oxidised to produce alcohols and with SO_2 they form sulphonic acids. At high temperatures aluminium alkyls disproportionate to give olefines.

$$R_2AlH \rightleftharpoons R_2AlH \pm \text{Olefine}.$$

The extent of the equilibrium is determined by the affinity of the aluminium hydride for the olefine, which decreases with increasing molecular weight. Isopentene can be produced from propylene by the reaction—

$$(C_5H_{11})_3Al + C_3H_6 \rightleftharpoons (C_5H_{11})_2AlC_8H_7 + C_5H_{10}$$

Molecular association of aluminium alkyls is known to occur with a certain amount of ionic bonding.

$$2\ Al\ R_3 \rightleftharpoons [R_2Al]^+ + [R_4Al]^-$$

Prof. Ziegler photographed at the Symposium.

In contrast, boron alkyls are unaffected by water, are unassociated and undergo no interchange of radicals.

Boron alkyls and aryls

The chemistry of the boron alkyls and aryls was reviewed by *Dr. W. Gerrard* of the Northern Polytechnic. These compounds are prepared by interaction of boron halides with Grignard reagents at low temperatures (−70°C.) under inert gas. The boronic esters have a trimeric ring structure unlike the corresponding silicon compounds which are chain polymers. An interesting application of these compounds being studied in the U.S. is the treatment of brain tumours. Sodium tetraphenyl boron is an analytical reagent for potassium, which may be accurately determined with ease and speed in fertilisers, plants and wines.

Silver and copper alkyls

Prof. C. E. H. Bawn, Liverpool University, described some of his recent work on silver and copper alkyls as a source of free radicals in studying the kinetics of various reactions. Silver methyl, prepared from lead tetramethyl at −80°C. is unstable and explosive with a half-life of a few minutes. As yet, there is no evidence of methyl radicals formed during its decomposition. Silver isobutenyl is more stable, producing isobutene in 97% yield with little dimerisation of the isobutenyl radical. This free radical takes its hydrogen from the solvent (alcohol) leaving the $CH_3C.HOH$ to continue the chain mechanism. Thirty-four moles of isobutene are thus produced for each mole of silver. Silver ethyl catalyses the polymerisation of acrylonitrile by radical build-up. The Ag-Et lasts only 6½ min., but it initiates the reaction by free radical formation, enabling the process to continue. The rate of styrene polymerisation by copper ethyl is proportional to the square root of the catalyst concentration. Copolymers may be formed in this way, but the process is very sensitive to temperature control.

Grignard reagents

Dr. M. C. Whiting described some recent research at Oxford on Grignard reagents containing double and triple bonds in the molecule. Nickel and iron carbonyls have also formed an interesting study as they form complexes which may find application in the synthesis of maleic acid derivatives. The chemistry of ferrocene was discussed by *Mr. G. R. Knox* of Sheffield, the evidence for the "sandwich" structure being presented.

Organo-tin compounds

The structural chemistry of organic compounds of tin was discussed by *Dr. G. Fowles* of Southampton University. This was a lively and entertaining lecture with wave mechanics made easy. The Sn—C bond is similar to the C—C bond, R_4 Sn being tetrahedral. Substitution of R— by a halide increases the polarity, exhibiting some ionic character. There are no known compounds in which the tin atom is attached to a double bond, but a compound of the type R_3Sn Ph. COOH has some quinonoid character. In R_3Sn Na, the tin atom carries a negative charge. Unlike the aluminium compounds tin tetralkyls have no tendency to dimerise or to form addition compounds, but by substitution of one or more alkyl groups by halide, complexes with pyridine or ammonia are formed.

Finally a lecture was given by *Dr. G. M. Dyson* on the applications of organo-tin compounds. The economics of the various ways of producing tetrabutyl tin were com-

pa.ed, that from a Grignard being th most suitable. The principal us of tin alkyls is as stabilisers for P.V.C. and chlorinated hydrocarbons which are heat and light sensitive. They are modifiers for Ziegler catalysts in the polymerisation of ethylene and isoprene. Tetraphenyl tin is a stabiliser for chlorinated transformer oils, eliminating the formation of HCl and so acting as a corrosion inhibitor. It is also a catalyst for the manufacture of silicones. The fungicidal and bactericidal activity of organic tin compounds has been known for some time. Research into their use as wood preservatives and as flow improvers in emulsion paints shows promising results. Their toxicity disappears in dioctyl and trioctyl derivatives and it is hoped that they may be safely used in P.V.C. food wrappers.

LEON RAPHAEL.

DETERGENTS AND DETERGENCY

(*Continued from page* 343)

(definitely, below 105°C.). A weighed amount of this complex is titrated potentiometrically with standard alkali to *p*H 8·5 to give a value for the mol. wt. which can be calculated for the dodecyl benzene sulphonate. With a knowledge of the true mol. wt. of the active ingredient, analysis can be completed by titration of a given solution with a standard cationic such as cetyl trimethyl ammonium bromide. The addition of the cationic to the anionic solution produces a complex insoluble in water but soluble in chloroform or carbon tetrachloride. The addition of one of these solvents to the system together with methylene blue indicator enables the titration to be carried out successfully. As the anionic/cationic complex is formed and dissolved in the organic layer, the blue colour of the dye is transferred to it.

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Alcohol and Alcoholometry

THE perfumer and all other chemists who use alcohol are concerned with the peculiarities which occur when it is processed. The term Alcoholometry is used for these phenomena by Karl Reichel in an article in Dragoco Report (No. 2, 1958) which we reprint here by permission of Dragoco, Gerberding and Co. G.m.b.H., of Holzminden, West Germany.

Percents by volume and by weight

The alcohol content of spirituous liquids at a given specific gravity can be expressed in per cent. by volume and per cent. by weight.

Per cent. by weight indicates the number of grammes of pure (100%) alcohol contained in 100 grammes of the liquid, while

Per cent. by volume indicates the number of cubic centimetres of pure (100%) alcohol contained in 100 c.c.

The reasons why per cent. by weight and by volume do not coincide are:

(1) Alcohol and water do not have the same specific gravity;
(2) If alcohol and water are mixed together, a decrease in volume or contraction occurs.

The relationships of per cent. by volume to per cent. by weight or the quantity of alcohol, depend on the specific gravity. As the specific gravity changes with the temperature, falling as the temperature rises and rising as the temperature falls, any determination of the specific gravity must necessarily take into account the temperature too, in order to convert the two other measurements taken at another temperature into values at the standard temperature.

An example will serve to show how per cent. by volume and by weight are computed, and how they differ:

If, for instance, we mix 100 litres of water with 100 litres of pure (100%) alcohol, we obtain, because of the decrease in volume which occurs, not 200 litres but 192·8. These 192·8 litres contain 100 litres of absolute alcohol, and thus the mixture contains

$100 \times 100 \div 192{\cdot}8 = 51{\cdot}8$ per cent. by volume of alcohol.

The alcohol content of the same mixture is computed as per cent. by weight as follows:

At 15°C. 100 litres of water weigh $100 \times 0{\cdot}999154 = 99{\cdot}9154$ kg.

At 15°C. 100 litres of pure alcohol weigh $100 \times 0{\cdot}999154 \times 0{\cdot}79425 = 79{\cdot}3578$ kg.

At 15°C. 192·8 litres of diluted alcohol weigh — 179·2732 kg.

Thus 100 kg. of the alcohol and water mixture contain $79{\cdot}3578 \times 100 \div 179{\cdot}2732 = 44{\cdot}26$ kg. of pure alcohol, *i.e.*

the alcohol content of the mixtures equals 44·26% by weight; 51·8% by vol., then, correspond to 44·26% by weight. If, however, we mix 100 kg. of water with 100 kg. of pure (100%) alcohol, we obtain 200 kg. of a mixture with a content of 50% by weight of alcohol.

The physical phenomena observed in working by volume need not be allowed for in working by weight.

Decrease in volume (contraction)

The nature of contraction and its exact causes are not known. What

Table 1

1 *litre of ethanol is composed by weight of:*			*Specific gravity at 15°C.*	1 *litre of ethanol is composed by volume of:*				
Per cent. by volume	*alcohol (96·13 % by vol.) grammes*	*water grammes*		*alcohol (96·13 % by vol.) c.c.*		*water c.c.*		
10	84·5	901·5	0·986	104·—	+	901·5	=	1005·5
15	127·—	854·—	0·981	156·—		854·—		
20	170·—	806·—	0·976	208·—		806·—		
25	211·5	759·5	0·971	260·—		759·5		
30	253·5	711·5	0·965	312·—		711·5		
35	296·—	663·—	0·959	364·—		663·—		
40	338·—	614·—	0·952	416·—		614·—		
45	380·—	564·—	0·944	467·5		564·—		
50	422·5	511·5	0·934	520·—	+	511·5	=	1031·5
55	464·5	459·5	0·924	572·—		459·5		
60	507·—	407·—	0·914	624·—		407·—		
65	549·—	353·—	0·902	676·—		353·—		
70	591·5	298·5	0·890	728·—		298·5		
75	633·5	243·5	0·877	780·—		243·5		
80	676·—	188·—	0·864	832·—		188·—		
85	718·—	132·—	0·850	884·—		132·—		
90	760·5	73·5	0·834	936·—	+	73·5	=	1009·5

Table 2—Alcohol Dilution Table

Per cent. by volume	*1 kg. of ethanol is composed of:* 96·13 *volume %* *alcohol grammes*	*water grammes*	*Volume taken by 1 kg. of ethanol of the strength indicated litre*
10	85·7	914·3	= 1·014
15	129·5	870·5	= 1·019
20	174·2	825·8	= 1·024
25	217·8	782·2	= 1·030
30	262·7	737·3	= 1·036
35	308·7	691·3	= 1·042
40	355·—	645·—	= 1·050
45	402·5	597·5	= 1·059
50	452·4	547·6	= 1·070
55	502·7	497·3	= 1·082
60	554·7	445·3	= 1·094
65	608·6	391·4	= 1·108
70	664·7	335·3	= 1·123
75	722·5	277·5	= 1·140
80	782·5	217·5	= 1·157
85	845·—	155·—	= 1·177
90	911·9	88·1	= 1·199

we do know is that a measured quantity of alcohol used with a mixture of alcohol and water does not decrease but that the water fraction does, and that this decrease in volume occurs in an absolutely uniform way. It can, therefore, be quantitatively observed and calculated.

In order that the factors which must otherwise be observed in mixing alcohol and water volumetrically may be disregarded and definite volumes still be obtained, I have computed (Table 1) the amounts by weight of alcohol and water which are required in each case for 1 litre of diluted alcohol of from 10 to 90 % by volume of alcohol content; as a basis of comparison I have ascertained the volumes of alcohol and water needed for obtaining a litre of diluted alcohol of the same strengths. By adding the two volumes it can be determined that in each case both of these figures together amount to more than 1,000 c.c. (= 1 litre). The volume greater than 1,000 c.c. is the result of contraction (decrease in volume). If the temperature of 15°C. is maintained, both volumes must yield practically 1 litre.

The above alcohol dilution table which I have computed gives the amounts by weight of 96·13% by volume alcohol and water necessary to prepare one kg. of ethanol in the strengths shown in terms of per cent. by volume.

Tables by Windisch indicating specific gravities and per cent, by volume in round numbers are the basis of these computations. For practical reasons the per cent. by volume has also been rounded off; these figures, however, are exact enough for practical use.

For 96·13% by volume alcohol, the following has been applied: specific gravity 0·812 = 94·08% by weight.

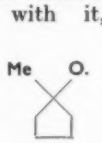
Organic Peroxides and Their Uses

AT a meeting of the Fine Chemicals Group of the Society of Chemical Industry Dr. E. G. E. Hawkins of the Distillers Co. Ltd. gave a lecture entitled: "Organic Peroxides and their Industrial Uses."

The chief methods of formation of peroxides were briefly considered and a number of examples of these methods given. Autoxidation was shown to be a reaction of widespread application; widely differing classes of compounds may give peroxides by this process.

The preparation, purification and a number of reactions of cumene hydroperoxide were described. The reactions included those with acid, ferrous ions, Grignard compounds, olefins, aldehydes, secondary alcohols and that of reduction.

In a similar way the formation and isolation of the hydroperoxides from methyl*cyclo*pentane and methylcyclohexane were detailed. The reactions of 1-methyl*cyclo*pentyl hydroperoxide described included the interesting one with ferrous ions: here the radical $MeCO(CH_2)_4$ was formed and dimerised to a C_{12} diketone. This radical and that mesomeric with it, are involved in the formation of other reaction products and in the products of autoxidation of the original hydrocarbon.



The related reaction between ferrous ions and the peroxidic mixture, obtained from treatment of cyclohexanone with hydrogen peroxide, gave a C_{12} dicarboxylic acid by a similar route: the yields appeared to depend on the type of peroxide involved.

The autoxidation of acyclic paraffins and olefins was then considered. Olefins were found to yield a variety of products, including a large amount of epoxide (under neutral conditions), alcohols and ketones derived from the hydroperoxide, and alcohols and carbonyl compounds of smaller molecular weight formed by fission of the molecule. The difficulty of reaching an understanding of the mode of formation of the epoxides and some of the fission products was mentioned.

Finally, some of the industrial applications of peroxides were described, and a list of the companies operating such plants was shown.

Discussion

In reply to *Dr. R. E. Bowman* and *Dr. R. J. Wicker*, the lecturer gave some practical details of the oxidation of isopropanol and cyclohexene. The alcohol was treated with hydrogen peroxide in the presence of a catalyst to form the hydroperoxide which decomposed to give acetone in good yield. The formation of the epoxide from cyclohexene proceeded only slowly when vanadium pentoxide was used as catalyst, but with osmium tetroxide the reaction was exothermic and went to completion.

Dr. B. J. Heywood asked about methods for the removal of peroxides from organic solvents, etc. Dr. Hawkins pointed out that while ferrous iron decomposes hydroperoxides readily, difficulty arises with peroxides. Catalytic hydrogenation was the safest way. He agreed with *Dr. H. J. Barber* that acidified potassium iodide could be used, but that the iodine formed could be a nuisance. Dr. Barber also asked what precautions should be taken in using organic peroxides, and received the reply that the explosive nature of the compounds bore some relation to the proportion of carbon. As the C : O ratio increased, compounds generally become less dangerous. Polymeric acetone was a highly dangerous substance and ketonic solvents should be used with extreme care. Reactions should be carried out in inert gas and behind safety glass.

BOOK REVIEWS

Source Book of Industrial Solvents

By Ibert Mellan. Reinhold. Pp. 267. 56*s.*

THE publishers have decided to rename this series of books to avoid confusion with other books covering similar or related subject matter. The choice of the new title is still unfortunate, since it replaces confusion by misrepresentation; the book has nothing to do with the source or origin of halogenated hydrocarbons, but gives data, particularly physical data, of the better known halogenated solvents. However, the detailed properties of the various liquids are well set out and should be specially useful for those concerned with formulations. Of the five sections in the book (general properties of the halogens and the four halogen hydrocarbons), that concerned with fluorine derivatives contains much information of interest in aerosol preparation. Some 75 solvents are considered in detail, while the properties of some of the less important solvents are given in tabular form.

The author has given little attention to the hazards involved in handling these solvents. Where available, dangerous concentrations of the chemicals should have been quoted. The toxic nature of tetrachlorethane is mentioned, but the reader is given no direction on the kind of precautions that should be taken. Again, methyl bromide, a highly toxic gas, receives no caution whatsoever. And, incidentally, the main use of methyl bromide (as a pesticide) is not mentioned, but instead insignificant uses are given. The fire hazard and the extinguishing properties are dealt with conscientiously and useful data and opinions are given. Personally I think that the explosion hazard associated with trichlorethylene and alkalies deserves serious warning. Methods of stabilisation of the solvents by various additions receives scant attention.

Some statements appear strange; for example, the opening sentence on the fluorine section: "Fluorine, the most active of the nonmetallic elements, is a unique element"—almost by definition any element is unique. Perhaps this is carping.

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The book is clearly written and reasonably free from printing errors and would be a useful addition to a technical library.

B. J. HEYWOOD

The Extra Pharmacopœia

Vol. 1. 24*th Edn. Pharmaceutical Press, London,* 1958. *Pp.* 1695. 65*s. net.*

IT IS 75 years since William Martindale produced his first epitome of information on drugs used in Great Britain, giving physicians and pharmacists extra pharmacopœial information on B.P. drugs, especially about their action and uses. He managed to get all he wanted to say into one slim volume. The present compilers of the book, the Pharmaceutical Society, have to use two volumes which between them total well over 3,000 pages.

The new Martindale has been completely revised and reset; some sections are in a slightly larger type. Latin names have been discarded, everything is now in plain English. The main section, Materia Medica, takes 1,354 pages. There follow two supplementary lists. Then there are three special sections dealing respectively with antibiotics, immunological products and radioactive isotopes. Finally there are a therapeutic index and a general index.

While generally the well-known alphabetical arrangement has been retained it has been modified to the extent of describing drugs of similar pharmacological action or therapeutic or pharmaceutical use in one section under the title of one member of the group. This is obviously convenient for the reader provided he is warned what to expect. Obviously the system throws more importance than ever on the reliability of the indexes.

Induction and Dielectric Heating

British Electrical Development Association. 1957. *Pp.* 191 *inc. index.* 8*s.* 6*d. net.*

TECHNICAL books fall broadly into two categories—those for the specialist in the subject in question, and those for the enlightenment of people outside that field. This book is definitely of the latter category, omitting, as it does, the techniques of effecting induction and dielectric heating and concentrating rather on how these can best be applied.

Induction or dielectric heating methods are a very great advance on the conventional methods of conduction, convection and radiation.

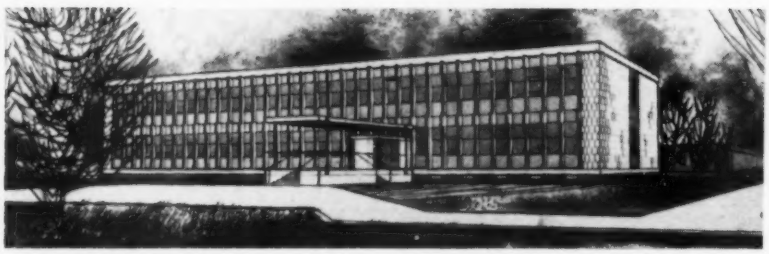
The heating effect is strictly localised, accurately controllable and even throughout the body being heated. This permits refinement of the heating process and reduction in heat wastage and space requirements.

Induction heating—in which a magnetic material is heated by being placed in a field of alternating current—has found wide application in metallurgy and a large proportion of the book is devoted to this aspect. Apart from heating solid metal, induction methods can be used to heat vessels such as autoclaves with greater speed and accuracy than by applying an external heat source. The process can be regulated by automatic timing devices.

Dielectric heating is even more versatile in that it is applicable to non-conducting materials. These are heated by forming the dielectric between metal electrodes carrying very high frequency (radio frequency) and high voltage. Since non-conductors of electricity are usually poor heat conductors, dielectric methods are particularly useful in dispensing with conduction by even generation of heat through the body. This method, which normally involves relatively small temperature changes, is used for example in working plastics, bonding wood with thermo-setting resins, binding foundry moulds, vulcanising rubber, extracting moisture from textiles and ceramics, processing food, and sterilising or de-infesting.

News . . .

Ethicon's New Building



At Sighthill, Edinburgh, a new two-storey office and laboratory block is being built for Ethicon Ltd., the suture manufacturers. Above is an architect's drawing of the building which will be heated by an under-floor electric installation. Directors' offices and conference rooms will be upstairs. Sales and financial staffs will work on the ground floor. The space on either side of the building is earmarked for further expansion.

Fraser to build Boots extension

Boots Pure Drug Co. Ltd. have awarded a contract for the supply and erection of extensions to their works at Nottingham to W. J. Fraser and Co. Ltd. The plant includes a number of agitated stainless steel pressure vessels which will be designed by Fraser and fabricated by them at their Barnsley works, the fabrication being completed in some cases on the site.

Boake Roberts invest £790,000 in new plants

A. Boake Roberts and Co. Ltd., placed orders for new plant and buildings costing £790,000 last year. In the next financial year, 1958-59, they plan a capital expenditure of £400,000. Well over half a million pounds have been spent on the new site at Widnes where, *inter alia*, phthalate plasticisers are being made.

Group profit after tax for 1957-58 was £249,162 (£120,410) and a final Ordinary dividend of 10%, making 15% for the year has been recommended.

Falling prices have led to stocks being written down by £26,000. Exports have increased a little and now absorb 20% of the turnover.

The company is to strengthen joint consultation with its employees.

New Monsanto laboratory

Mr. Harold Watkinson, M.P., Minister of Transport and Civil Aviation, opened the new oil additives technical service laboratories at the Newport, Monmouthshire, factory of Monsanto Chemicals Ltd. on July 7. Speaking of the challenge of the technological age, Mr. Watkinson said: " If it is met in the same spirit as one sees in the chemical and oil industries—the spirit which has led to the development of splendid new facilities such as these laboratories—we need not fear for the future."

Sir Miles Thomas, chairman of Monsanto, said the building of the new laboratories at Newport was part of a comprehensive plan for extending the company's applicational research and technical service.

" Much of our business—over 40%—comes from exports, and it is in the export markets that the greatest challenge lies," he said.

Laporte increase peroxide capacity

A big increase in hydrogen peroxide capacity in W. Europe is foreseen by Mr. P. D. O'Brien, managing director of Laporte Industries Ltd. Speaking at the A.G.M. in London on July 17, he said that to meet expected competition arising from the European Free Trade Area his company had strengthened its position generally. In particular, Laporte Chemicals Ltd. was starting up a large new hydrogen peroxide plant which works by a new method. Organic peroxide capacity was also being built up; new plants have been erected at Warrington.

Production of titanium oxide had been increased and now, in common with other producers, capacity exceeded demand. But Mr. O'Brien believes the titanium oxide market will expand.

A long harboured desire to enter the Canadian market as manufacturers has been fulfilled by the purchase of Pembina Mountain Clays Ltd. The Laporte group has had considerable experience in the fullers' earth field (through the Fullers' Earth Union Ltd.) and strenuous efforts are being made to achieve success.

C.R.L. becomes the National Chemical Laboratory

The Chemical Research Laboratory at Teddington, Middlesex, has been re-named The National Chemical Laboratory. At the same time its functions have been re-defined in accordance with the proposals of the Council for Scientific and Industrial Research.

Henceforth the Laboratory will concentrate its effort on a few objectives, covering only a limited part of the whole field of chemical research, so as to be able to make a real impact on problems of national importance.

These include the determination of the fundamental physico-chemical properties of chemical compounds which are required, for example, by chemical engineers for the design of full-scale industrial plant. The related study of the development of techniques of purification of materials such as metals and chemicals, with a view to the supply of standard samples of pure substances for reference purposes, is also in this category.

Work will also continue on corrosion and on the extraction of elements of atomic energy interest from low grade ores.

The new name has been chosen because it was thought that the old one suggested that the Laboratory exists primarily to serve the chemical industry, which already has extensive research facilities of its own, or to carry out work over the whole field of fundamental chemical research. This is not so. The purpose of the Laboratory will be to undertake selected fundamental and applied chemical researches of national importance, which could not otherwise be worked on.

" Sell to Canada " trip

Chemical and petroleum plant and equipment are among the capital goods and ancillaries for which Canada has a great and continuing need. This is one of the points made by the Dollar Exports Council Delegation to Canada in the report of their 26-day trade tour of Canada undertaken last April and May. They say that Canadians generally recognise the good sense of buying from Britain, if only to safeguard their own export trade to the U.K. But many British firms do not appreciate the vastness of the country and customers and potential customers are not visited often enough. They have also under-estimated the need for advertising; in particular it is a mistake to finalise Canadian advertisements in Britain.

Canada wants more British investment. Currently it is running at the rate of $100 million a year and British firms have a financial interest in or control of over 1,000 companies in Canada. The report is published by the Dollar Exports Council, 21, Tothill Street, London, S.W.1.

IRAQI VISITOR ENTERTAINED BY A.B.P.I.

The revolution in Iraq of July 14 gives added interest to the trip made to this country by Mr. Bahjat Kashmula, Director-General of Medical Supplies in Iraq. On July 3, at the end of his visit, he was entertained to lunch by the Association of British Pharmaceutical Industry. At the lunch Mr. Kashmula said that for the past 18 years Iraq had bought from Britain most of its supplies of drugs, sera, vaccines and surgical instruments. He expressed great satisfaction with the quality of these products. In this picture, taken at the luncheon, Mr. Kashmula is talking to Dr. T. H. Kerfoot, A.B.P.I. president (right), and Mr. J. K. Vaughan Morgan, Minister of State, Board of Trade (left).

I.S.I.S. technical enquiry service

Owing to the general rise in costs and the difficulty of providing adequate specialised staff it is no longer possible for us to answer technical enquiries free of charge. In future all technical—not commercial or " where-to-buy "—enquiries will be referred to our associated company, Isis (Industrial and Scientific Information Service Ltd.), which operates from Leonard Hill House, Eden Street, London, N.W.1.

Isis is directed by an Information Officer who is a graduate chemist (Ph.D.) with industrial and research experience and a wide knowledge of information sources. If the enquiry is of the type that can be answered by the Service a fee will be quoted before work is put in hand. Fees will be on a moderate scale directly related to the amount of work required. The Service is in no way competitive with the work of Consulting Chemists and Engineers. Enquiries requiring the judgment and resources of Consultants will be answered by supplying the names of suitable experts, for which information no fee will be charged.

Commercial, " where-to-buy " enquiries will, as hitherto, be answered free of charge.

Enquiries of both types are welcomed. We hope our readers will make the fullest use of our Service.

Industrial injuries insurance

The Minister of Pensions and National Insurance, Mr. John Boyd-Carpenter, has made regulations altering the Schedule of occupational diseases for which workers in specified occupations are covered for the benefits of the Industrial Injuries Act. The regulations implement the recommendations of the Industrial Injuries Advisory Council, made in their recent report on the Review of the Prescribed Diseases Schedule, and came into operation on July 7.

The regulations cover 40 out of the 42 industrial diseases prescribed under the Industrial Injuries Act. (The two others, pneumoconiosis and byssinosis, are both lung conditions caused by dust and are already covered separately by special provisions which have been revised within the last five years.) In 22 of these 40 diseases the new provisions differ from those in the old Schedule, but it is expected that only a few insured persons will be affected by the changes. These alterations have been made in view of developments in medical knowledge and in industrial techniques.

Among the changes is the widening of the description of poisoning by some substances, *e.g.* lead, benzene, to include certain of their compounds. Extensions are also made in the definitions of other diseases including industrial dermatitis, radiation injuries, and cramps of the hand or arm caused by repetitive movements.

Special benefit provisions are made for persons who have already contracted a disease, in a form now covered by the extension of the regulations, between July 5, 1948, when the Industrial Injuries scheme began, and July 7, 1958. They can receive benefit from July 7 provided that, on that date, they were either incapacitated for work or suffering from a loss of faculty, as a result of the disease. Any claim for benefit should be made to the local Pensions and National Insurance Office.

Cosmetic science congress

Under the chairmanship of Dr. A. W. Middleton, F.R.I.C., the British Congress of Cosmetic Science will be held at University College, Gower Street, London, W.C.1, on April 15-17, 1959.

The four sessions will be divided as follows: analysis of raw materials; assessment of finished products; manufacturing or processing; biological assessment.

Application forms can be obtained from the Hon. Organiser, Dr. R. H. Marriott, c/o County Laboratories Ltd., Honeypot Lane, Stanmore, Middlesex.

Radioisotopes safety

The expert panel on health and safety in the use of radioisotopes convened by the International Atomic Energy Authority has completed its first series of meetings in Vienna.

The panel concentrated its work on the preparation of a Manual of Safe Practice for the isotope users within a scientific establishment. The larger task of establishing international standards, requiring the formal adoption by international and national authorities, would require considerable further work after the completion of the first phase.

All the recommendations for the draft manual were made unanimously by the experts, who will consider the final draft again at the end of August, thus enabling the Director General to have it ready at the time the Second Session of the General Conference of the Agency meets during the latter part of September in Vienna.

Tube makers merge

John Dale Ltd. have acquired impact extrusions Ltd. of Feltham Middlesex, manufacturers of collapsible tubes.

Under the chairmanship of Mr. O. J. Bruun, Impact Extrusion have concentrated on the production of soft metal tubes. They have specialised in the requirements of the pharmaceutical industry.

Much of the plant they use is made by their associated company, Andersen and Bruun's Fabriker A/S of Copenhagen.

John Dale state that as a result of this merger, they are now the largest producers of collapsible tubes in the world.

Ciba Fellowship Trust

The Ciba Companies in Great Britain, under the chairmanship of Sir Arthur Vere Harvey, C.B.E., M.P., have set up a Trust Fund in this country, known as the Ciba Fellowship Trust, which is designed to help graduates and undergraduates from the U.K. and Eire to continue their scientific studies at continental centres of learning.

The Ciba companies understand that the trend in recent years towards study in America has overshadowed the value of contact with continental centres and that such links with Europe should be encouraged. The Trust will provide for 10 to 12 fellowships a year in chemistry, physics or an allied subject.

Lord Hives, C.H., and Professor Sir Alexander Todd, F.R.S., have agreed to join Sir Arthur Vere Harvey as trustees. The Trust hopes to begin its activities next year.

Fatty alcohols for water conservation

The practical use of a monomolecular film of fatty alcohols as an effective and economical method of conserving stored water in hot and arid climates was pioneered by the Commonwealth Scientific and Industrial Research Organisation of Australia in co-operation with Price's (Bromborough) Ltd., the Merseyside manufacturers of fatty alcohols. As a result a blend (*Si-Ro-Seal* hexadecanol) and a technique of application was developed which was particularly suited to the Australian climatic conditions, and with which remarkable savings are said to have been achieved.

Price's are now to co-operate with the East African Meteorological Department in extended trials at reservoirs at Nachingwea in Tanganyika, and on July 1 Mr. C. E. Higgs of Price's technical service department left for Kenya to assist in these trials. He will spend twelve weeks in British East Africa and will visit the Sudan on his return journey.

Price's have recently appointed Gailey and Roberts Ltd. as their selling agents for water conservation alcohols in Kenya, Tanganyika, Uganda and Zanzibar, and I.C.I. (Sudan) Ltd. for the Sudan.

Fluorine symposium

A symposium on fluorine chemistry is being arranged by the Chemical Society for July 15-17, 1959. It is to be held in the University of Birmingham. Topics in Organic, Inorganic and Physical Chemistry will be covered.

All details are being handled by the Secretary of the Fluorine Symposium, Chemistry Department, The University, Birmingham.

Technical Press Review—August

Food Manufacture. — Fruit Canning in Victoria; Modern Trends in Factory Lighting Equipment and Maintenance; The Problem of Improving Nutritive Value—2; The Elimination of Pathogens from Frozen Whole Egg—2; A New Press for Food Materials.

Petroleum.—Review of European Petroleum Industry; Holland as an Oil Country; Petroleum Prospecting by Microbiology; Oil and Natural Gas in Italy; Separation of Gases in Oil Refineries; I.C.I.'s Titanium Works.

Atomics and Nuclear Energy. — American Civilian Power Reactor Programme; American Prospects for Economic Nuclear Power; The Sodium Graphite Reactor; American Developments in the Use of Zirconium Metal; Thermo-Nuclear Fusion Power; Ceramics in Nuclear Energy; Effect of Heavy Radiation on Metals; Poland's Nuclear Power Programme.

Paint Manufacture. — Surface Coatings derived from Tall Oil—3; Fading of Printing Inks; Glycerol in Inks; Japanese Printing Ink Industry.

Corrosion Technology.—Propeller Corrosion and Cavitation Erosion; Cathodic Protection of Ballast Tanks; New System to beat Hull Corrosion.

Automation Progress. — Automatic Programming and Magnetic Amplifiers in Rolling Mills; Automation of Steel Making; Low Cost Data Logging; Continuous Heat Treatment with Automatic Control; Design of Electrically Controlled Machine Tools; Semiconductors and their Uses.

Dairy Engineering. — Glass for Pipelines; Automatic Cleaning for 5,000 ft. of Pipelines; Pipes and Pipe Fittings; Towards Dairying Automation—2; Notes on Rinsing Techniques—1; "Tailor-made" Instant Milk; Large-Scale Processed Cheese Production.

World Crops.—How a Selective Herbicide Works; Scrub Clearance by Chemicals; Eradication of Water Hyacinth; Risks of Pesticides to Fish; This Year's Royal Show.

Chemical and Process Engineering.—Pall Rings and Packed Towers; CO_2 Removal and Recovery; Heat Transfer; Review of ACHEMA Exhibition; Manufacture of Adhesives; Photographic Film Base Factory.

Research institutes' open day

The work of the Sondes Place Research Institute, Dorking, Surrey, was explained to a number of visitors at a recent "Open Day." The Institute undertakes sponsored research, and for this reason it was not possible to disclose a great deal of detailed information. However, visitors were able to see a wide range of activities. Subjects of current research projects included chemicals from sugar, fertiliser granulation, ion exchange membranes, electrodialysis, and fuel cells for the direct generation of electricity from fuel. Analytical methods being studied include gas chromatography, U.V. absorption spectroscopy and X-ray diffraction.

Exemptions from Import Duty

The Safeguarding of Industries Act, 1921, has been repealed. All articles formerly chargeable with Key Industry Duty will from January 1, 1959, become chargeable with import duty under the Import Duties Act, 1958.

The temporary exemption of such articles from duty in certain circumstances is provided for in this Act, and the Board of Trade are now considering what articles shall be exempt from duty for a period from January 1, 1959, to June 30 or September 30, 1959, as appropriate. Lists of the articles (mainly chemicals) which are at present exempt from Key Industry Duty will be found in the Board of Trade Journal for February 14, May 9 and June 20, 1958.

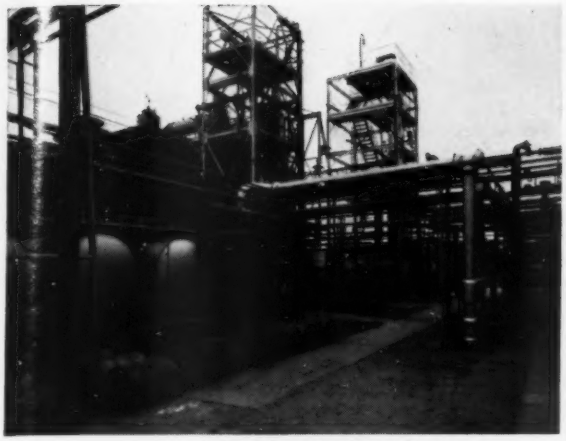
Requests for exemption and requests for further details of the exemption procedure under the Import Duties Act, 1958, should be sent to the Board of Trade, Tariff Division, Horse Guards Avenue, London, S.W.1.

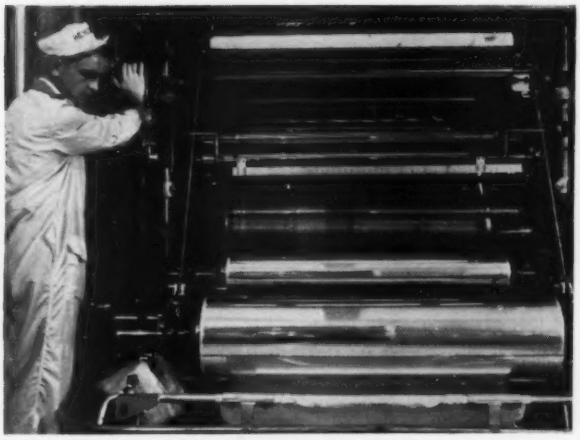
Perkin Centenary awards

The Perkin Centenary Fellowship has been awarded to Mr. Dennis Balmforth of Coventry and will be tenable from October 1 next in the Department of Colour Chemistry at the University of Leeds.

Perkin Centenary Scholarships have been awarded to Mr. Brian Higginbottom of Bolton, tenable at the College of Technology, Loughborough, and to Mr. W. K. McCourt of Belfast, tenable at Queen's University, Belfast.

Arrangements have also been made for a Perkin Exchange Lectureship whereby short visits will be exchanged between Prof. A. J. Birch, F.R.S., of the University of Manchester, and Prof. V. Prelog, of the Eidenössische Technische Hochschule, Zürich. Prof. Birch will visit Zürich in September and it is hoped that Prof. Prelog will return the visit next year. Each will deliver one or more lectures during the visit.





Left: The extensive solvent recovery and distillation plant at the Brantham factory of Bexford Ltd. Right: Mechanical unloading of finished reel of photographic film base.

Emphasis on solvent recovery at film base plant

Solvent recovery is one of the major tasks in the manufacture of photographic film base and a great deal of work has been done on the problem by Bexford Ltd., at their Brantham, Suffolk, factory. This factory is the only one in the British Commonwealth manufacturing photographic film base. Before it was built in 1946 the great majority of film base was imported into this country. Now Bexford supply all the requirements of one of its parent companies, Ilford Ltd. (the other is B.X. Plastics Ltd.) and the saving in hard currency is over 5 million dollars a year. Besides film base, Bexford make packaging grade film in cellulose triacetate and nitrocellulose.

Film base is made by dissolving cellulose triacetate fluke in methylene chloride and plasticiser, filtering and spreading it on a heated revolving band in an even film which is then stripped off, seasoned (to remove final traces of solvent), treated to facilitate adherence of the photographic emulsion (subbing) and finally re-seasoned. It is then rolled in 1,000 ft. lengths. Although apparently simple the process is extremely complicated, requiring precise control at every stage. Bexford's plant cost £2,500,000.

The solvents used in these processes are very expensive and have to be recovered as efficiently as possible. In the case of the casting machine (where the dope is spread) the solvent is sucked through a refrigerator plant, the partially stripped air being purified and afterwards returned to the plant for re-use. Since it is essential that none of these solvents shall escape into the air, the casting cabinet is maintained under very slight suction by means of fans which deliver air, containing a small amount of residual solvent, to large carbon adsorber plants in which they are recovered, purified and subsequently re-used.

Bexford have an extensive solvent recovery plant and have invented various devices to improve the recovery process. One of the main problems is identification of the components in the recovered mixture. Vapour phase chromatography has been found extremely useful for separating components and identifying them by thermal conductivity. An infra-red gas analyser and an acoustic gas analyser are used to detect the presence of solvent in the air of the factory to ensure that permissible limits are not exceeded, and also for ancillary tests in solvent recovery procedures. Another check for methylene chloride leaks in the plant is a flame photometer in which copper wire is burned to produce a green flame; the presence of methylene chloride changes the intensity of the colour.

Although devoted essentially to the manufacture of a single product, the Bexford factory and associated laboratories employ a wide variety of interesting chemical techniques and, for example, their work on solvent recovery is of wide importance.

Gift to help rheumatism research

A gift to help in the ten-year-plan to find out the causes of rheumatism has been received by the Empire Rheumatism Council.

At a dinner at the Royal Automobile Club the chairman of the Council, Dr. W. S. C. Copeman, was presented with a cheque for £1,500, with probably more to come at a later date, by Mr. A. J. C. Gormley, chairman of John Wyeth and Brother, pharmaceutical manufacturers.

Courlose distribution

Courtaulds Ltd. have appointed J. M. Steel and Co. Ltd., the U.K. distributors of certain grades of *Courlose*. This registered trade mark applies to all grades of sodium carboxymethyl cellulose manufactured by Courtaulds. The various grades are particularly useful for thickening, preventing coagulation, stabilising dispersions, sizing and coating in a wide variety of industries, *e.g.* textiles, paint, food, pharmaceuticals, ceramics and paper.

The grades produced differ in degree of etherification and in degree of polymerisation of the cellulose. They also differ in the extent to which the pure sodium carboxymethyl cellulose is mixed with other substances which either are the by-products formed in the preparation or are specific additions. The principal varieties are distinguished by key letters associated with the word *Courlose*, as follows:

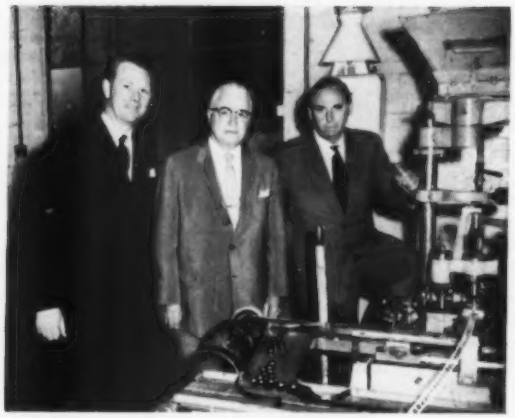
Pure grades *Courlose* F salt-free
Courlose P pharmaceutical
Technical grades *Courlose* A (alkaline)
Courlose N (neutralised).

J. M. Steel and Co. Ltd. will distribute the F and P grades and they will continue to distribute the *Celacol* brands of methyl and hydroxyethyl methyl cellulose manufactured by British Celanese Ltd. Commercial enquiries and orders for *Courlose* F, *Courlose* P and *Celacol* should, therefore, be addressed to one or other of the offices of J. M. Steel and Co. Ltd.

Kekulé symposium

The Chemical Society are organising the Kekulé symposium on Theoretical Organic Chemistry which will be held in the large hall of the Friends House, Euston Road, London, N.W.1, from September 15-17, under the chairmanship of Prof. Sir Christopher Ingold.

People



Mr. George A. Reinhard, Jnr., director of engineering of the Armstrong Cork Co. Ltd., Pennsylvania, recently visited the company's Kingsbury, London, works. He is seen here with (*left*) Mr. H. H. Whittaker, plant manager of the Kingsbury works, and (*right*) Mr. R. B. Gillham, chief engineer, inspecting a Johnson moulded cap assembly machine.

Mr. W. J. Wakeling has just celebrated his 75th birthday, and retired after 59 years with Johnsen and Jorgensen Ltd., manufacturers of glass containers for the pharmaceutical industry, etc. To give Mr. Wakeling a happy send-off the directors of the company and members of the staff held a dinner for him in London at which he was presented with a dining-room clock and a cheque. In our photo Mr. Wakeling is being congratulated by J. and J. director, Mr. I. B. Throndsen.

Dr. W. E. Ripper has been appointed managing director of Dow Agrochemicals Ltd.

Sharples Centrifuges Ltd. have appointed **Mr. E. O'K. Trowbridge** managing director of the company, and **Mr. J. J. Serrell** to the board.

Mr. Stanley R. Glover has joined Quickfit and Quartz Ltd. as mechanical engineer specialising in method improvement planning.

Laporte Industries Ltd. have elected **Mr. J. L. Harvey,** M.B.E., D.L., chairman of their subsidiary, the Fullers' Earth Union Ltd., in place of **Mr. L. P. O'Brien,** who has retired from the board of that company. Mr. O'Brien remains chairman of Laporte Industries Ltd., of which company Mr. Harvey is also a director.

Dr. E. London, formerly of the Liverpool College of Technology, has taken up the post of chemical development manager at Lederle Laboratories' Division of Cynamid of Great Britain Ltd. Dr. London is working at the new Lederle factory at Gosport.

Mr. E. K. Samways, B.SC., B.PHARM., F.P.S., F.R.I.C., has been appointed a director of Allen and Hanburys Ltd.

Mr. P. H. D. Ryder has been appointed chairman of Q.V.F. Glastechnik G.m.b.H., the German subsidiary company of Q.V.F. Limited, chemical engineers in glass.

In recognition of his services to education, the honorary degree of Master of Science has been conferred on **Mr. C. W. Maplethorpe,** F.P.S., F.R.I.C., M.I.CHEM.E., managing director of Allen and Hanburys Ltd. by the University of Manchester.

Mr. C. W. Maplethorpe

He joined the company as a research chemist in 1924. He was elected to the board of directors in 1943 and appointed managing director in the following year.

He has been a member of the Council of the Pharmaceutical Society of Great Britain since 1943 and Chairman of its Educational Committee since 1945. He is Chairman of the British Pharmaceutical Codex Revision Committee and of the Committee which issued the first British Veterinary Codex on January 1, 1954. He is a member of the Home Office Poisons Board, the Governing Body of the Chelsea College of Science and Technology and the Council of the School of Pharmacy of the University of London.

Company Finance

Distillers Co. Ltd. Trading profit for year to March 31 £24,800,254 (£23,369,732). Net profit £10,582,818 (£9,817,587). Ordinary dividend 20% (18¾%).

Boots Pure Drug Co. Ltd. Profits for the year ended March 31 amounted to £5,178,510 compared with £4,553,998, an increase of nearly 14%. Sales exceeded £78½m., which was an increase of nearly 9% on the previous year. Dividend 18% (16%).

New 'phone number

The telephone number of Allen and Hanburys Ltd., Bethnal Green, London, offices is now Shoreditch 4343.

The Warren Spring Laboratory

The new D.S.I.R. laboratory, now being built at Stevenage, will be called the Warren Spring Laboratory. The name is taken from a lane that used to run across the site on which the laboratory is being built.

The Council for Scientific and Industrial Research want the new laboratory to be a versatile station, free to work on any subject which becomes important for the nation and which cannot be fitted into the programme of another research body.

It has already been decided that work will be carried out on air pollution; on the synthesis of oil and chemicals from carbon monoxide and hydrogen; and on mineral processing.

The title of the Director, Mr. S. H. Clarke, C.B.E., will be "Director of the Warren Spring Laboratory."

New sales company

Sales of products manufactured by British Chrome and Chemicals Ltd. and Brotherton and Co. Ltd. will now be handled by a newly formed subsidiary company, Associated Chemical Companies (Sales) Ltd., with its registered office at Brotherton House, Westgate, Leeds 1.

New Products

Antibiotic-sulpha veterinary treatment

Distillers Co. (Biochemicals) Ltd. have introduced *Streptaquaine* sulpha oral suspension veterinary for the treatment of scour. It combines dihydrostreptomycin with sulphadimidine, plus the astringents, kaolin and pectin. The 16 fl. oz. dispensing pack retails at 27s. 6d.

★

Drug for sheep

The Wellcome Foundation's new drug *Frantin* (bephenium embonate) has been introduced for the control and prevention of nematodiriasis in British sheep flocks.

This disease has become one of the chief problems facing producers of fat lambs, and in 1953 it appeared as a serious epidemic in the counties along the Anglo-Scottish border. Thereafter it was less prominent for a time, but again this season it has assumed major proportions and apparently extended the area of its attack.

It is claimed that in experimentally infected lambs *Frantin* was shown capable of killing not only the adult worms but also the larval stages, which by damaging the wall of the gut are the main cause of the disease. A recent survey in the Border counties is reported to have shown that the drug cured most cases treated over a wide area.

★

Treatment for blackhead in turkeys

Merck Sharp and Dohme Ltd. have introduced an agent for the prevention and treatment of blackhead in turkeys. Marketed under the name of *Hepzide*, its generic chemical name is nithiazide. It is available in two forms:

Hepzide soluble powder 16·7% is for the treatment of blackhead in turkeys and chickens and hexamitiasis in turkeys.

Hepzide insoluble premix 20% is primarily intended for the prevention of blackhead by the medication of the feed.

★

Anti-fungal pessaries

Allen and Hanbury Ltd. have added Dequadin pessaries to their range of preparations of Dequadin chloride, their new antimicrobial which is said to be effective against nearly all the bacteria pathogenic to man and against yeast-like fungi, including *Candida albicans*. The pessaries have been specially formulated for the treatment of vaginal infections.

Each pessary contains 10 mg. Dequadin (Dequalinium) chloride in a bland non-irritating base. A box of 30 (with applicator) retails at 10s.

Zeo-Karb 225

% *D.V.B.*	*Water regain as grammes of water per grammes of Na resin*	*Particle sizes*
1	5·7	14-52, 52-100, 100-200
2	3·4	14-52, 52-100, 100-200, <200
4·5	1·5-2	14-52, 52-100, 100-200, <200
8	0·9-1·1	14-52,* 52-100, 100-200, <200
20	0·4-0·6	14-52, 52-100, 100-200, <200

* Standard *Zeo-Karb* 225.

De-Acidite FF

Water regain as grammes of water per gramme of Cl resin	*Particle sizes*
1·6-2·0	14-52, 52-100, 100-200
1·1-1·5	14-52,* 52-100, 100-200, <200
0·6-0·9	14-52,† 52-100, 100-200, <200

* Standard *De-Acidite FF* type 510.
† Standard *De-Acidite FF* type 530.

Ion-exchange resins

A new unit has been set up by the Permutit Co. Ltd. for the production of cation and anion exchange resins. These are being increasingly used for chromatographic separation and analytical purposes. They are based on the well-known *Zeo-Karb* 225 and *De-Acidite FF* ion-exchange resins. The cross-linking of *Zeo-Karb* 225 is specified in terms of the nominal weight percentage of divinylbenzene in the hydrocarbon polymer. The corresponding swelling of water regain is also tabulated.

The manufacture of anion-exchange resins introduces extra cross-links in addition to those originally placed in the hydrocarbon structure. With such resins, therefore, a figure for the original cross-linking used is misleading in relation to the structure of the final resin, which is better specified by means of the weight swelling or water regain. Consequently, in the case of *De-Acidite FF* only this figure is given in the table. Similarly it is not possible to produce *De-Acidite FF* in as wide a range of cross-linking as in the case of *Zeo-Karb* 225, since materials with very high water regain are difficult to manufacture reproducibly. In the case of both resins, the smallest particle size cannot be supplied in combination with the lowest degree of cross-linking, since the swelling of the loosely cross-linked materials renders it impossible to produce beads in this size range.

★

Iron treatment for pigs

Benger Laboratories Ltd. have launched a new anti-anæmia product for pigs. Known as *Imposil*, it is a brand of ferrimicrodex and contains 50% more iron than the previous Benger product. With one 2 c.c. injection of *Imposil* each three-day-old piglet will now receive 150 mg. of iron which is completely absorbed and utilised.

Trials in the U.S. and in Britain are reported to have shown that this new "iron-and-a-half" treatment gives added resistance to many piglet diseases caused by iron deficiency.

The cost to the farmer of the new product remains the same at 2s. 6d. per shot. A 50 c.c. (25 dose) pack has been introduced.

★

Moulded activated carbon

Moulded shapes of activated carbon are now being produced commercially for the first time by National Carbon Co., a division of Union Carbide Corporation, U.S.A. Sales outside the U.S. and Canada will be handled by Union Carbide International Co. Claimed to have a high adsorption capacity, and being easier to handle than activated carbon granules of equal volume, the new line of cube and wafer shapes is expected to find wide use in the adsorption of unwanted odours and vapours. Although almost any size and shape can be produced, two sizes of wafers are standard. One is approximately $\frac{1}{8}$ in. thick and $1\frac{1}{4}$ in. dia. (3 by 33 mm.), and the other is about $\frac{3}{8}$ in. thick and $1\frac{1}{2}$ in. dia. (9 by 38 mm.). The smaller wafer weighs 1·8 g. and is designed to fit into caps for pharmaceutical bottles to adsorb odours. The larger wafer will find similar use for bigger bottles, and either can be used for odour control in packages of potato chips or similar products.

A cubical shape is also available, measuring approximately $\frac{3}{8}$ in. (9·5 mm.) on a side. It was designed as a "getter" for hermetically sealed relays and precision instruments. Placed in the case before sealing, the activated carbon cube adsorbs vapours driven off from the plastic insulation of the instrument wires by the heat generated during operation—vapours that might otherwise corrode the precious metal contact points. The cube weighs

1·2 g. and a single cube in an instrument is reported to be sufficient to adsorb all volatiles normally generated when the instrument is placed in service.

If moisture control is desired in addition to the adsorption of odours and vapours, a desiccant such as silica gel can be incorporated into these moulded activated carbon shapes.

★

Steroid formulations

Merck Sharp and Dohme Ltd. have marketed two new steroid formulations, *Codelprone* tablets (Meprobamate with Prednisolone buffered), and *Codelsol* with Neomycin skin lotion (Prednisolone 21-phosphate with Neomycin Sulphate).

Codelprone multiple compressed tablets consist of a central core of Prednisolone with an outer coat of the muscle relaxant Meprobamate and the antacid aluminium hydroxide. They are indicated in the symptomatic treatment of certain rheumatic and arthritic disorders, especially fibrositis and muscle spasm.

Codelsol with Neomycin skin lotion contains the new steroid compound, Prednisolone 21-phosphate, together with the antibiotic Neomycin. The properties of this combination are indicated for the control of a wide range of inflammatory skin conditions.

★

Fungicide

A new chemical called Captan may be as effective a weapon against fungi as DDT is against insects. Captan stems from efforts made by an American petroleum company to produce an improved fungicide from the chemicals in petroleum. Manufactured by Calhio Chemicals Inc., a subsidiary of Stauffer Chemical Co., and sold by Stauffer and California Spray-Chemical Corporation, it is marketed under the name of *Orthocide* 50-*W* and is a wettable powder. The first step in its manufacture involves the chlorination of carbon disulphide to form an intermediate, perchloromethylmercaptan (PMM). The end product, captan (N - trichloromethyl - mercapto-4-cyclohexene-1,2 dicarboximide), is made by reacting PMM with tetrahydrophthalimide. The production of the intermediate PMM is a particularly sensitive point in the process, since contact of the reactants with iron in any form will cause the formation of CCl_4 instead of PMM. There is also the problem of avoiding corrosion by the chlorine present. The use of Monel for much of the equipment solves both problems; it is used for piping, pumps, valves, heat exchangers and rupture discs. Stauffer supply PMM to other chemical companies which use it as an intermediate in other chemical processes and drums of solid nickel are used to protect purity during transit.

News from Abroad

AUSTRALIA

Pharmacognosy laboratory planned

The Western Australian Government is considering setting up a laboratory for testing local plants for medicinal drugs. Health Minister Nulsen has instructed Public Health Commissioner Dr. Henzell to consult university authorities to discover what equipment would be necessary, where it could be accommodated, and how many specially trained technicians would be necessary.

New Sydney factory

English supplier of medical preparations Calmic Ltd. plans to build a factory for the manufacture of its products in Sydney. Director and secretary Mr. H. T. Mallinson recently visited Sydney seeking a suitable site.

Consolidated Zinc purchase

Consolidated Zinc Corporation Ltd. has acquired the equity of Pure Chemicals Ltd. in order to widen its chemical interests. P.C. produces a considerable range of stabilisers for the P.V.C. plastics industry and also manufactures a wide variety of fine chemicals.

SOUTH AFRICA

Grape oil losses

South Africa loses 235,000 gal. of oil annually because insufficient use is made of the 12,000 tons of grape pips rejected at the wine presses. A statement by the Department of Agriculture said that a valuable and useful oil could be obtained from them. Grape oil was used in other countries for the treatment and packing of seedless raisins, salad oils, cosmetic preparations and paints.

Organic chemicals exports to Far East satisfactory

Klipfontein Organic Products states that it is holding its markets in the Far East—£200,000 worth of chemicals were exported to China from this factory last year and £100,000 worth to the East Indies and Malaya. Firms that export to Indonesia all reported that the civil war had not hampered their trade.

Chemical to " revolutionise " dry-cleaning

African Explosives and Chemical Industries Ltd., who manufacture perchloroethylene, a chlorinated hydrocarbon solvent, has issued the following statement: " Perchloroethylene is one of the most powerful grease solvents known and, because it is completely non-inflammable, holds the promise of completely revolutionising the dry-cleaning industry in the Union. The use of the solvent in dry-cleaning has stood the test of time overseas, particularly in the United States, where it has been used extensively for many years.

As it is non-inflammable, this cleaner can be used in " shop-units " installed in small premises which are able to clean garments within a very short space of time. Overseas the use of perchloroethylene has resulted in the dry-cleaning industry becoming almost an over-the-counter trade. The use of the chemical in South Africa has been developed over the past year or so and it is expected that the number of " shop-units " will be trebled in the next four to five years. The existing plants in operation, most of which are on the Witwatersrand, are capable of cleaning over 400 tons of garments per month, according to the latest estimates.

SOUTHERN RHODESIA

Witchdoctors' cures

European-trained doctors have called on African witchdoctors in Salisbury, Southern Rhodesia, to reveal the source of their medicines. The witch-doctors replied that they would supply samples of the herb medicines, but would not reveal the plants from which the herbs were made.

The scene was the first large-scale meeting of the Southern Rhodesia Nyanga (African Herbalist) Association, which was held in Salisbury's Harare African township. After an hour's frenzied dancing in traditional costumes, a hush fell on the 30 nyangas when a European-trained African medical practitioner engaged as a houseman at the Harare African hospital urged them to reveal the sources of their medicines. He said: " Your medicines have been called heathen because they have never been brought out into the open. We qualified African doctors are prepared to help you in what you are doing, but we need your co-operation."

The president of the Nyanga Association replied: " There are numbers of diseases which European medicines have failed to cure, but which our herbs can cure. The European doctors want us to hand over the roots from which we make our medicines so that they may examine them. However, these European doctors keep their own medicines secret. If they simply show us a bottle with a label on it then we will do the same. We will send our medicines to the laboratories —but not the whole plant."

NEW TRADE MARKS

APPLICATIONS

Insecticides, fungicides, weedkillers, etc.

DUPONT.—757,453. *E. I. Du Pont de Nemours and Co.*

MELANIDE.—772,669. *Plant Protection Ltd.*

GERMISTAT. — 773,587. *Thomas Hedley and Co. Ltd.*

RACALET.—774,534. *Racasan Ltd.*

MESANIDE.—773,086. *Plant Protection Ltd.*

ZIDE.—773,789. *Bugge's Insecticides Ltd.*

TERVON.—776,342. *Profarma Ltd.*

Pharmaceuticals

AURALGAN.—738,287. *Doho Chemical Corporation.*

HIPREP.—768,889. *Kingsley Pharmacy Ltd.*

DIAPEC.—771,764. *Chas Pfizer and Co. Inc.*

POLIRIN.—772,212. *Glaxo Laboratories Ltd.*

PREMINSOGEN.—774,072. *Organon Laboratories Ltd.*

CLISTIN.—775,188. *McNeil Laboratories Inc.*

ENTERO-VIOFORM.—775,207. *Ciba Ltd.*

BISKAVITE.—775,351. *Andomia Products Ltd.*

KOLPRIOL.—776,170. *Organon Laboratories Ltd.*

COLTROMYL.—766,876. *Les Laboratoires Français de Chimiotherapie S.A.*

DIOCTOSEN.—771,888. *Ward Casson Ltd.*

SLENDERELLA.—772,131. *Slenderella Systems Inc.*

GLUCEFF.—772,175. *Boots Pure Drug Co. Ltd.*

KETATEST.—772,311. *The Denver Chemical Manufacturing Co.*

INSORAL.—772,633. *U.S. Vitamin Corp.*

EMANOL.—772,666. *Imperial Chemical Industries Ltd.*

RED VELVET.—773,067. *Harold Godfrey.*

PREMENTABS.—773,408. *Organon Laboratories Ltd.*

ULCEMIN.—773,662. *Ward Casson Ltd.*

COSENIN.—773,911. *Westminster Laboratories Ltd.*

PREMENQUIL.—774,071. *Organon Laboratories Ltd.*

ZIXA.—774,841. *John Adams.*

FOLKS.—775,880. *Smith Kendon Ltd.*

FIOBROL.—775,894. *J. R. Geigy S.A.*

TUMESON.—776,096 *Farbwerke Hoechst A.G.*

HACKS.—765,199. *White-Hudson and Co. Ltd.*

PREDNINE.—768,460. *Parke, Davis and Co.*

PREDNICOL.—768,461. *Parke, Davis and Co.*

MOLLAXA. — 769,028. *Det danske Medicinal and Kemikalie-Kompagni A/S.*

CASCORN.—772,686. *Westminster Laboratories Ltd.*

EYESULE.—773,462. *Duncan, Flockhart and Co.*

COPELS.—B773,673. *Imperial Chemical Industries Ltd.*

UFACID.—773,807. *British Schering Ltd.*

DAIRYMAID.—774,198. *Joseph Crosfield and Sons Ltd.*

D-NEOMIN.—763,640. *Glaxo Laboratories Ltd.*

CENTURY-PAK.—765,043. *American Cyanamid Co.*

DASC. — 767,442. DASCAIDS. — 767,443. *Pfizer Ltd.*

FEBROLA.—771,753. *Boots Pure Drug Co. Ltd.*

FERRANO.—771,959. *Ward Blenkinsop and Co. Ltd.*

EXPULSAR.—773,468. *The Wellcome Foundation Ltd.*

PREDOCULON.—774,068. *Organon Laboratories Ltd.* PREDOPHTAL.—774,069.

HIMAIZOL.—774,752. *Trufood Ltd.*

FARMALABOR.—774,124. "*Farmalabor*" *Laboraratori Chimici e Farmaceutici S.p.A.*

NILPIREX.—774,866. *Imperial Chemical Industries Ltd.*

THIOBANE.—769,182. *Parke, Davis and Co.*

CYSTAMEZ.—774,163. *Imperial Chemical Industries Ltd.*

TREVIDAL.—774,635. *Organon Laboratories Ltd.*

CANILIN. — 774,887. *Glaxo Laboratories Ltd.*

VERALBA.—729,386. *Allied Laboratories Inc.*

LEUCOTROPIN.—755,841. *Silten Ltd.*

SWEETEX.—B771, 934. *Boots Pure Drug Co. Ltd.*

FERMARATE.—772,350. *Glaxo Laboratories Ltd.*

PERGRIL.—772,382. *The Wellcome Foundation Ltd.*

BENZODERM.—B773,228. *Crookes Laboratories Ltd.*

PASADE.—773,544. *T. J. Smith and Nephew Ltd.*

EUFACID.—773, 806. *British Schering Ltd.*

AKILAINE.—773,873. *Laboratoires Asepta.*

PABRACORT.—774,109. *Paines and Byrne Ltd.*

Cosmetics and toilet preparations

REALISTIC.—764,508. *Technichem (Winton) Ltd.*, trading also as *The Realistic Co.*

NIKKI.—B767,208. *Nikki Novelties Ltd.*

DODIE.—771,852. *François Peyron.*

LENTHERIC SHEER PINK.—775,203. *Lentheric Ltd.*

FAIRY PRINCESS BY COTY BUBBLE BATH.—764,975. *Coty (England) Ltd.*

GALA.—765,631. *Gala of London Ltd.*

BON VOYAGE.—766,597. *Dana (England) Ltd.*

VEILED RADIANCE. — B768,358. *Elizabeth Arden Ltd.*

ULTRA - TAN SPRAY. — B770,459. *Lloyd Hamol Ltd.*

KERANOVE.—771,797. *Eugène Ltd.*

FRANCIL.—773,745. *Parfymeri Trading A/B.*

HIGHLAND DEW.—772,567. *Lavapine Ltd.*

BATHJOYS.—772,885. BATHJOY.—772,957. *Reckitt and Sons Ltd.*

DELORAINE.—B773,685. *Ulter (Bradford) Ltd.*

ARTHONE.—775,153. *Arthol Ltd.*

NEW COMPANIES

These particulars of new companies have been extracted from the daily register of Jordan and Sons Ltd., company registration agents, Chancery Lane, London, W.C. 2.

A. Revai and Co. (Trading) Ltd. 21.5.58. 7-8 Idol Lane, London, E.C.3. Importers and exporters of chemicals, solvents, plastics, essential oils, etc. £100. Dirs.: Paul C. Gondos and Richard E. Spall.

Valins Chemists Ltd. 2.5.58. Sefton Street, Litherland, Liverpool 21. Take over bus. of dispensing chemist and druggist cd. on as "Valins" at Litherland, Liverpool 21. £100. Dirs.: Mrs. M. O. E. and Moss L. Valins.

Sames-Mearns Ltd. 22.5.58. 16 Porters Avenue, Dagenham, Essex. Chemists, druggists, etc. £3,500. Dirs.: David A. Sames and Beatrice A. M. Mearns.

Levmedic Ltd. 1.5.58. Mnfrs. of and dlrs. in chemical, medical, pharmaceutical, veterinary, cosmetic and preservative preparations, etc. £50,000. Subs.: Martin H. Lowry and P. Sheridan Hickey.

K. N. Horniblow Ltd. 1.5.58. 4 Queens Buildings, Clonmel Street, Llandudno. To take over bus. of a chemist cd. on as "K. N. Horniblow" at Llandudno. £400. Dirs.: Harold J. C., Lucy and Betty M. Walton.

Charles H. Ford Ltd. 1.5.58. 1 North Bridge Road, Doncaster. Chemists, etc. £3,000. Dirs.: Charles H. and Mrs. Maisie E. St. G. Ford.

Universal Laboratories Ltd. 1.5.58. To manfc., assemble, process and deal in chemical, medical and pharmaceutical products, etc. £100. Subs.: Brian J. G. Page and R. D. Douglas.

Hairvac Co. Ltd. 2.5.58. 46 Upper Maudlin Street, Bristol. Mnfrs. of and dlrs. in toilet requisites, preparations, etc. £100. Dirs.: Charles R. Soper and Wm. J. Morgan.

Leslie Ingall (Chemists) Ltd. 2.5.58. 1 Station Road, Silloth, Cumberland. To take over bus. cd. on at Silloth by Leslie Ingall, etc. £6,000. Dirs.: Leslie and Marjorie Ingall.

Lincoln (Chemicals) Ltd. 2.5.58. Victoria House, Southampton Row, London, W.C.1. £100. Dirs.: Eric and Sybil Lincoln.

P. C. Geddes (Becontree) Ltd. 6.5.58. To take over bus. of chemist cd. on at 774 Green Lane, Becontree, Dagenham, Essex, by Peter C. Geddes, etc. £6,000. Dirs.: Peter C. and Mrs. Dora H. Geddes.

P. C. Geddes (Dagenham) Ltd. 6.5.58. To take over bus. of chemist cd. on at 923 Green Lane, Dagenham, Essex, by Peter C. Geddes, etc. £4,000. Dirs.: Peter C. and Mrs. Dora H. Geddes, and William B. Reid.

P. C. Geddes Ltd. 6.5.58. To take over bus. of chemist cd. on at 25 High Road, Chadwell Heath, Essex, by Peter C. Geddes, etc. £6,000. Dirs.: Peter C. and Mrs. Dora H. Geddes, and John W. Cameron.

D. Tunbridge Ltd. 6.5.58. 41 Regent Road, Gt. Yarmouth. To take over bus. of chemist and druggist formerly cd. on by the late Donald Tunbridge. £6,000. Dirs.: Mrs. Dorothy M. Tunbridge, Wm. T. Moore and John B. Thompson.

Tretol (Export Sales) Ltd. 29.5.58. Mnfrs. of and dlrs. in chemicals, gases, drugs, medicines, etc. £100. Subs.: Tretol Ltd., Tretol House, The Hyde, London, N.W.9, and S. Trisk.

THE CHEMICAL MARKET

NICKEL SULPHATE CHEAPER

LONDON.—**Nickel sulphate** has come down to £195 10s. ton against £200. **Oleine, B.P.,** extra pale, is also cheaper, from £165 ton to £160. **Aluminium stearate** has risen by £5 to £258 10s. ton. **Calcium chloride** is £1 dearer at £17 10s. ton. **Sulphathiazole** is dearer by a few pence to 39s. 9d. kg. **Iodides,** ethyl, are available in 4 kg. bottles at 62s. 9d. kg. The lowest quantity quoted for **α-tocopherol** is 25 g. lots, still at 1s. 1d. g. **Stearines** are now produced by the Emersol process so that the terms single, double and triple pressed no longer apply. Equivalent grades are given as Pristerene flake.

FINE CHEMICALS

Acetanilide
12½ kg. 7s. 4d. kg.
Arsenious oxide B.P.
7-lb. lots 1s. 9d. lb.
1 cwt. lots 1s. 2d. lb.
Ascorbic acid
100 kg. £4 14s. kg.
Aspirin
56 lb. 5s. 2d. lb.
1-cwt. 4s. 11d. ,,
5-cwt. lots 4s. 9d. ,,
Atropine
Sulphate, 500 g. & £59 18s. 6d. kg.
Alkaloid, 500 g. £69 10s. kg.
Benzene B.P.C. 28-lb. lots 1s. 8d. lb.
Benzoic acid 12½ kg. 7s. 4d. kg.
Benzyl benzoate
According to pack 5s. to 5s. 6d. lb.
Bismuth oxide B.P.C. 1934
28-lb. lots 26s. 10d. lb.
Bismuth salts 28-lb. lots:
Carbonate 22s. 3d. lb.
Subgallate 21s. 1d. ,,
Salicylate 21s. 9d. ,,
Subnitrate 20s. 5d. ,,
Borax B.P.
Powder (hessian bags) £58 10s.
,, (paper bags) £57 10s.
Extra fine (hessian bags) £59 10s.
,, ,, (paper bags) £58 10s.
Boric acid B.P.
Crystal (hessian bags) £96 10s.
,, (paper bags) £95 10s.
Powder (hessian bags) £94
,, (paper bags) £93
Bromine B.P.C.
7-lb. lots 6s. lb.
Caffeine 50 kg. 42s. 6d. kg.
Calamine 50 kg. 4s. kg.
Calcium gluconate
1 cwt. lots dlvd. 3s. 7d. lb.
Calcium glycerophosphate
50 kg. 28s. 6d. kg.
Calcium lactate B.P.
7-lb. lots 3s. 6d. lb.
1-cwt. lots 2s. 11d. ,,
Chloral hydrate 50 kg. 10s. kg.
Citric acid, B.P.
Powder or granulated:
1-cwt. lots £11 5s. cwt.
5-cwt. lots £11 ,,
Codeine
Alkaloid 100 g. £106 7s. 6d. kg.
Phosphate 100 g. £110 ,,
Ephedrine 500 g. lots
Hydrochloride 3 kg. £6 12s. 3d. kg.
Alkaloid 3 kg. £12 7s. kg.
Sulphate 3 kg. £6 12s. 3d. ,,
Eucalyptol
1-cwt. lots 12s. 6d. lb.
5-cwt. lots 12s. ,,
Ferri ammonium citrate B.P.
1-cwt. lots, scales 4s. 8d. lb.
1-cwt. lots, granules 3s. 11d. ,,
Ferrous gluconate
1 cwt. lots dlvd. 6s. 3d. lb.
Gallic acid B.P.C.
1-cwt. lots 9s. 8d. ,,
Glycerophosphoric acid
24 litres 11s. 10d. litre
Glycine (amino acetic acid)
12½ kg. 18s. 10d. kg.
Hexyl resorcinol 10 kg. £7 10s. kg.
Hydroquinone 12½ kg. 23s. 10d. kg.
Iodides
Ethyl
4 kg. bottles 62s. 9d. kg.
Mercury, red B.P.C.
28-lb. lots 27s. lb.
1-cwt. lots 26s. ,,
Potassium B.P.
28-lb. lots 8s. 6d. ,,
1-cwt. lots 8s. 3d. ,,
Sodium B.P.
28-lb. lots 13s. ,,
1-cwt. lots 12s. 9d. ,,
Iodine, Chilean crude,
99% min. in wooden casks 15s. kg.
Iodoform
12½ kg. and under 50 kg. 42s. 6d. kg.
Lactose 50 kg. 3s. 2d. kg.
Lithium salts 5-cwt. lots
Benzoate 10s. lb.
Carbonate B.P.C. 11s. 3d. ,,
Chloride (commercial) powder 11s. ,,
,, granular 10s. 9d. ,,
Hydroxide 9s. 9d. ,,
Citrate B.P.C. 9s. ,,
Sulphate 8s. 6d. ,,
Salicylate, 10 cwt., dlvd. 9s. 9d. ,,
Magnesium carbonate B.P.
Light cwt. lots dlvd. £129 ton
Magnesium trisilicate
28-lb. packages
28-lb. lots 4s. 3d. lb.
1-cwt. lots 3s. 10d. ,,
5-cwt. lots 3s. 7d. ,,
Bulk rates for larger quantities are from 3s. 1d. lb. in 1 ton lots
Manganese hypophosphite B.P.C.
7-lb. lots 13s. 11d. lb.
1-cwt. lots 12s. 11d. ,,
Mercuric chloride B.P.
50-kg. lump 48s. 6d. kg.
Methyl salicylate 1-cwt. lots 3s. 3d. lb.
Morphine
Alkaloid, 100 g. £138 18s. 4d. kg.
Nicotinamide 1 kg. £4 10s. kg.
Nicotinic acid
12½ kg. 52s. 6d. kg.
1 kg. 55s. ,,
Oleine, B.P. extra pale, 3/4 cwt. drums returnable carriage paid G.B. £160 ton
Phenolphthalein 50 kg. 24s. 3d. kg.
Phosphoric acid B.P.
(s.g. 1·750) 10 carboy lots 1s. 4d. lb.
Potassium permanganate B.P.
1-cwt. lots dlvd. 1s. 11¼d. lb.
Procaine hydrochloride (foreign) 2 kg. 59s. kg.
Quinine 1 oz. lots 4s. 4d. oz.
Riboflavin
100 g. 5½d. g.
10 g. 7d. ,,
Saccharin
500 g. £7 4s. for this quantity
Salicylic acid
B.P., dlvd. 3s. 2½d. to 5s. 6d. lb.
Silver nitrate
500 g. 4s. 11½d. oz.
Sodium benzoate B.P.
1-cwt. lots 2s. 9½d. lb.
1-ton lots 2s. 7½d. ,,
Sodium salicylate
50 kg. 8s. 8d. kg.
12½ kg. 9s. ,,
Sodium thiosulphate
Crystals, photographic quality
1-ton lots 49s. cwt.
Stearic acid B.P.C. flake, carriage paid G.B. £154 ton
Strychnine 25 oz.
Alkaloid 5s. 10d.
Hydrochloride 4s. 11d.
Sulphate 4s. 11d.
Sulphaguanidine
12½ kg. 33s. kg.
50 kg. 32s. ,,
Sulphanilamide
12½ kg. 16s. 6d. kg.
50 kg. 15s. 4d. ,,
Sulphathiazole 12½ kg. 39s. 9d. kg.
Tannic acid B.P. Levis
1-cwt. lots 10s. lb.
Tartaric acid B.P.
Powder or granulated,
10 cwt. or more £14 cwt.
Terpineol, B.P.
40-gal. drums 2s. 5d. lb.
1-cwt. lots 2s. 8d. ,,
Theophylline, B.P.
500 g. 27s. 6d. for this quantity
Thiamine hydrochloride
100 g. 4d. g.
1 kg. £13 7s. 6d. kg.
Thioglycollate
Ammonium 12s. 4d. to 16s. 4d. lb.
Calcium:
7-lb. lots 17s. 3d. ,,
5-cwt. lots 14s. 3d. ,,
α-Tocopherol 25-g. lots 1s. 1d. g.
Vanillin 26s. to 30s. 6d. lb.
Zinc oxide, B.P.
2-ton lots £102 ton

GENERAL CHEMICALS

Acetic acid 1-ton lots dlvd.
80% Technical £99 ton
80% Pure £105 ,,
Glacial B.P. £114 ,,
99-100% Glacial £111 ,,
98-100% Glacial £108 ,,

Acetic anhydride
1-ton lots dlvd. £143 ton
Acetone
5-gal. drums, free, non-returnable £128 ton
40 to 45-gal. drums, 10-ton lots £88 ,,
Alum, potassium granular crystals
50 kg. 1s. 2d. kg.
Aluminium hydroxide B.P.C. 34
28-lb. lots 2s. 4d. lb.
Aluminium stearate
(Precipitate) 1-ton lots £258 10s. ton
Ammonia
Persulphate £6 2s. 6d. cwt.
Phosphate: Mono- £106 ton
Di- £100 ,,
Amyl acetate
B.S.S. 10 tons and over £251 ton
Technical £249 ,,
Amyl alcohol
Technical in 1-ton lots £260 ton
Arsenic White powdered ex store £37-£38 ton
***n*-Butyl acetate**
10-ton lots £173 ton
***n*-Butyl alcohol**
10-ton lots £142 ton
Calcium chloride
Solid 70 to 72%, 4-ton lots dlvd. £17 10s. ton
Calcium oxide (Lime)
Ex marble 28-lb. lots 3s. 10d. lb.
Caustic soda
Solid 1-ton lots, from £37 0s. 6d. ton
Chloroform B.P. ½-ton lots 3s. 1½d. lb.
Chromic acid
Dlvd. U.K. (less 2½%) 2s. 0¼d. to 2s. 0¾d. lb.
DDT 3s. 0½d. to 3s. 2d. lb.
2 : 4-Dichlorophenoxyacetic acid
99% pure, 1-cwt. bags £340 ton
Dimethyl sulphate 400 lb. drum lots 1s. 8d. lb.
Ether (Di ethyl ether)
Tech. B.S.S. and Solvent B.P.
1-ton lots in drums 2s. lb.
Ethyl acetate 10-ton lots £145 ton
Ethyl alcohol
95% Gay Lussac 66·0 o.p.
2,500 to over 300,000 proof gallons per year in tank wagons
4s. 2¾d. to 4s. 0¼d. per proof gal.
Ferrous sulphate 50 kg. 1s. 4d. kg.
Formaldehyde
40% by volume dlvd. England
1-ton lots £38 15s. ton
Glycerin
1,260 s.g. chem. pure, 5 tons and up, 5-cwt. drums £201 10s. ton
1,260 s.g. refined pale straw, indus., 5 tons and up, 5-cwt. drums £196 10s. ton
Hexamine
1-ton lots
Technical, bulk 1s. 8d. lb.
B.P.C. 1s. 11d. ,,
Hydrochloric acid
Commercial 18s. 6d. cwt.
Hydrogen peroxide
27·5% weight £128 10s. ton
35% weight £158 ,,
Lactic acid (1-ton lots)
Pale tech. 44% by weight 1s. 3¼d. lb.
Dark tech. 44% by weight 9¼d. lb.
Magnesium chloride
Solid (ex wharf): 1-ton lots £17 10s. ton
Magnesium sulphate £14 10s. to £15 5s. ton
Mercurous chloride (calomel)
50 kg. 65s. kg.
Mercury sulphide, red
Ton lots and over 30s. 6d. lb.
Methylated spirits (Industrial)
Perfumery quality 500 gal. and upwards:
61 o.p. 7s. 4d.
74 o.p. 7s. 11½d.
5 to 10 gal.:
61 o.p. 8s. 8d.
74 o.p. 9s. 3½d.
Methyl ethyl ketone
10 tons dlvd. in drums £143 ton
Methyl isobutyl carbinol
10 tons and up, in drums, dlvd. £163 ton
Methyl isobutyl ketone
10 to 50 tons, in drums, dlvd. £169 ton
Naphthalene
Crystal, dlvd., 4-ton lots, spot £65 4s. 3d. ton
Ball and flake (ditto) £73 14s. 3d. ,,
Nickel sulphate
dlvd. ton lots £195 10s. ton
Nitric acid 70% intermediate £32 ,,
Pentachlorphenol
Flake, technical, 1-ton lots, dlvd. 2s. 2d. lb.
Phenol Crystals:
Under 1 ton dlvd. from 1s. 7d. lb.
10 tons and over dlvd. in returnable drums from 1s. 4½d. lb.
Phthalates
10 ton lots in drums
Diethyl (B.S.) £187 10s. ton
Dimethyl (B.S.) £179 ton
Potassium bromide
50 kg. 5s. 6d. kg.
12½ kg. 5s. 8d. ,,
Potassium carbonate
Calcined 96 to 98% (1-ton lots ex store) £76 ton
Hydrated (1-ton lots) £74 10s. ,,
Potassium fluoride
28-lb. lots 5s. 1d. lb.
Potassium sodium tartrate
5-cwt. lots £10 cwt.
Soda ash
1-ton lots dlvd., from £17 10s. 6d. ton
Sodium cyanide
96-98% £128 ton
Sodium hydroxide 28 lb. lots:
sticks (1 lb. bottles) 4s. 3d. lb.
pellets ,, ,, 3s. 9d. ,,
Sodium metal 28-lb. lots 3s. 8d. ,,
Sodium metasilicate
Dlvd. U.K. in ton lots £26 ton
Sodium phosphate
Dlvd. ton lots: Di-sodium, crystalline £40 10s. ton
Anhydrous £88 ,,
Tri-sodium, crystalline £39 ,,
Anhydrous £86 ,,
Sodium silicate
according to quantity, grade and delivery point
4 ton lots £13 10s. ton
1 ton lots £15 ,,
Sodium sulphate Ex works:
(Glauber salt) £13 ton
(Salt cake) unground, full truck loads £8 16s. 6d. ton
Sodium sulphide
Broken, returnable drums, dlvd. ton lots £37 2s. 6d. ton
Flake, ditto £38 12s. 6d. ,,
Solid ditto £36 2s. 6d. ,,
Sodium sulphite
Commercial crystals 4-ton lots £24 10s. ,,
(Dlvd. London in 1-cwt. single non-returnable bags)
Sodium tripolyphosphate
1-ton lots £95 ton
Stannic chloride 28-lb. lots 8s. 11d. lb.
Stannous chloride 28-lb. lots 9s. 5d. lb.
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96-98% 28-lb. lots 3s. lb.
Sulphuric acid, ex-works, according to quality and quantity
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C.O.V. 96% from 11s. to 14s. cwt.
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28-lb. lots sticks 6s. 9d. lb.

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Refined, deodorised, 2-ton lots, naked, ex works £108 ton
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Pristerene 62 flake £133 ,,
Pristerene 61 flake £113 ,,
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Sudan spot (duty paid) £29 ,,
Bleached white (slab) £36 ,,
Refined yellow (slab) £29 ,,
Benzoin
Sumatra spot £27 cwt.
Siam spot (nominal) £2 7s. 6d. lb.
Candelilla Spot £24 10s cwt.
Carnauba
Prime, Spot £51 cwt.
Fatty grey £28 10s. ,,
Gum arabic Lump £7 cwt.
Karaya Powder, Spot 3s. 6d. lb.
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No. 2 orange £11 15s. ,,
Transparent white 4s. 4d. lb.
Pale dewaxed 6s. ,,
Tragacanth
No. 1 spot £130 cwt.
No. 2 spot £121 ,,
Pale leaf £49 ,,
Amber £38 ,,
Brown to Red £28 ,,

NEW PATENTS

COMPLETE SPECIFICATIONS ACCEPTED

Steroids

Steroid compounds. *Merck and Co. Inc.* 799,722.

Dehydrocortical hormones. *Upjohn Co.* 799,493.

Preparation of steroid compounds. *Pfizer and Co. Inc.* 799,343.

Steroids and their manufacture. *Upjohn Co.* 800,640.

Steroid compounds and their derivatives. *Pfizer and Co. Inc.* 800,644.

Antibiotics

Antibiotic composition containing oleandomycin. *Pfizer and Co. Inc.* 799,208.

Insecticides

Insecticidal compositions. *State of Israel, represented by the Prime Minister's office, and M. Neeman.* 800,490.

Insecticidal composition. *S. C. Johnson and Son Inc.* 799,915.

Dyestuffs

Metallisable monoazo dyestuffs of the benzene-azo-quinoline series. *Imperial Chemical Industries.* 800,144.

Metallisable monoazo dyestuffs of the benzene - azo - 8 - hydroxyquinoline series. *Imperial Chemical Industries Ltd.* 800,145.

Dyeing of polyester fibres. *Sandoz Ltd.* 800,200.

Process for dyeing fibres and films of vinyl polymers and preparations therefore. *Ciba Ltd.* 799,374.

Coppered polyazo dyestuffs. *Sandoz Ltd.* 799,925.

Blue levelling anthraquinone dyestuffs. *Sandoz Ltd.* 799,732.

Process for producing or stripping dyeings. *Ciba Ltd.* 800,401.

Toilet preparations

Hair waving compositions. *P. F. A. Grein.* 799,432.

Method of decomposing sulphur and/or nitrogen compounds. *Metallges AG.* 798,395.

Process for the manufacture of carbon disulphide. *Food Machinery and Chemical Corporation.* 798,947.

Atomizers. *Coty Inc.* 798,878.

Hair waving preparations and process. *Ashe Laboratories Ltd.* 798,574.

Fused bath salts. *Imperial Chemical Industries Ltd.* 798,860.

Detergents, soaps

Soap compositions. *Armour and Co.* 799,279.

Detergent compositions. *Unilever Ltd.* 799,421.

Detergent compositions. *Unilever Ltd.* 799,421.

Soap compositions. *Armour and Co.* 799,403.

Rapid directed interestification of glycerides. *T. Hedley and Co.* 799,263.

Fertilisers

Preparation of ferrous sulphate suspensions. *British Titan Products Co. Ltd.* 800,410.

Process of manufacturing non-conglomerating ammonium sulphate and products resulting therefrom. *Soc. Carbochimique Soc. Anon.* 800,483.

Process for producing fertilisers. *Lummus and Co.* 800,417.

Complete fertilisers. *Wintershall A.G.* 799,428.

Pharmaceuticals

Thiourea compounds. *Monsanto Canada Ltd.* 799,373.

Acridine compounds and the preparation thereof. *Parke, Davis and Co.* 799,361.

Aspirin. *Monsanto Chemicals Ltd.* 798,633.

Therapeutic compositions. *Biorex Laboratories Ltd.* 798,655.

Stabilised vitamin D composition and process for the production thereof. *Hoffmann-La Roche and Co. A.G.* 799,068.

Production of intermediates for the synthesis of reserpine and related compounds. *Research Corp.* 799,269; 799,270; 799,272.

Process for the preparation of acridene compounds. *Parke, Davis and Co.* 799,366.

Quaternary derivatives of aminoalkyl esters of organic acids, and processes for their preparation. *Boehringer Sohn, C.H.* 800,329.

Phenothiazine derivatives. *Soc. des Usines Chimiques Rhône-Poulenc.* 799,919.

Stereoisomer of cycloheximide and the manufacture thereof. *Upjohn Co.* 799,731.

Preparation of derivatives of 7,9-pyrimidino pyrimidine-(1,3). *Dr. K. Thomae Ges.* 799,177.

Acridine compounds and their preparation. *Parke, Davis and Co.* 799,361.

Cyano purines, related derivatives and methods of preparing them. *Wellcome Foundation Ltd.* 799,384.

Preparation of iron derivatives. *J. McNicholl.* 799,202.

Extruded protein products. *Unilever Ltd.* 799,353.

Production of germicidal compositions. *Monsanto Chemicals Ltd.* 799,400.

Veterinary compositions. *Biorex Laboratories Ltd.* 799,415.

Miscellaneous

Method of isolating substantially pure dextran from fermentation products and their degradation. *Commonwealth Engineering Co. of Ohio.* 800,288.

Process for removing carbon monoxide from gaseous mixtures. *Soc. per Azioni Vetrocoke.* 799,310.

Elimination of phenol from aqueous liquors. *Allied Chemical and Dye Corp.* 799,327.

Process of treating polyamides of low molecular weight so as to increase their average molecular weight and improve their physical and chemical properties. *Du Pont de Nemours and Co.* 799,328.

Disposal of noxious gases containing nitrogen oxide fumes. *Du Pont de Nemours and Co.* 799,159.

Process for preparing hydrogen peroxide *Solvay et Cie.* 799,099.

Continuous sulphonation of organic liquids. *T. Hedley and Co. Ltd.* 799,039

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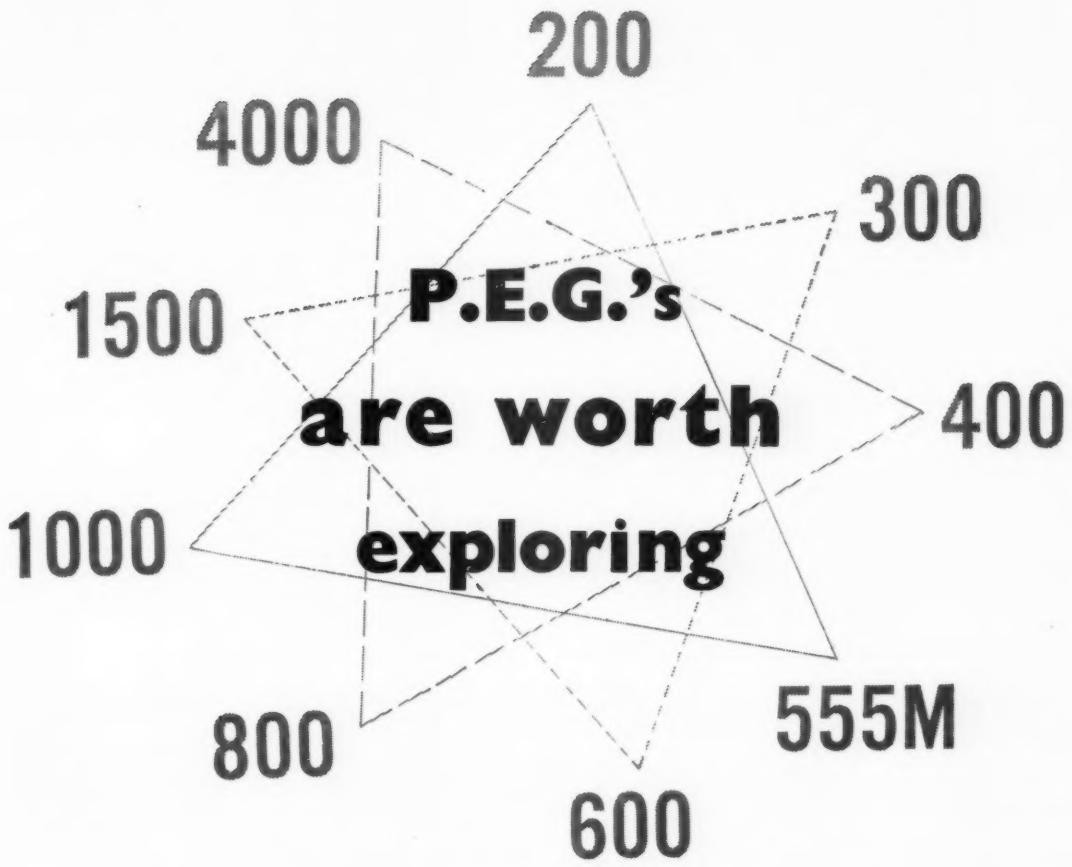

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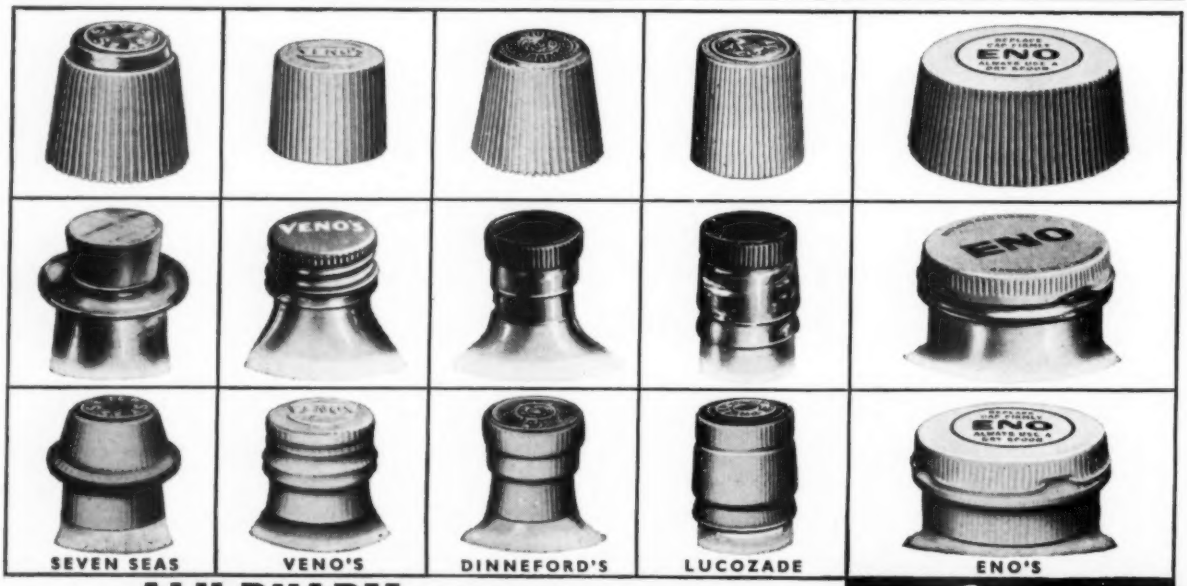

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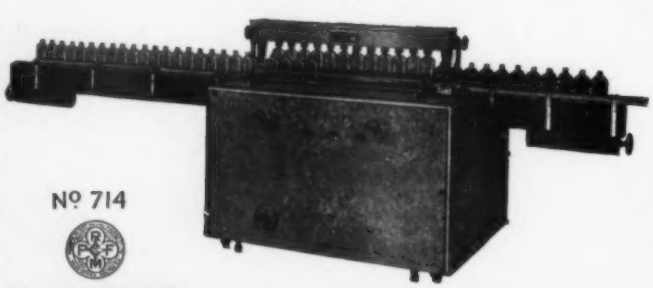

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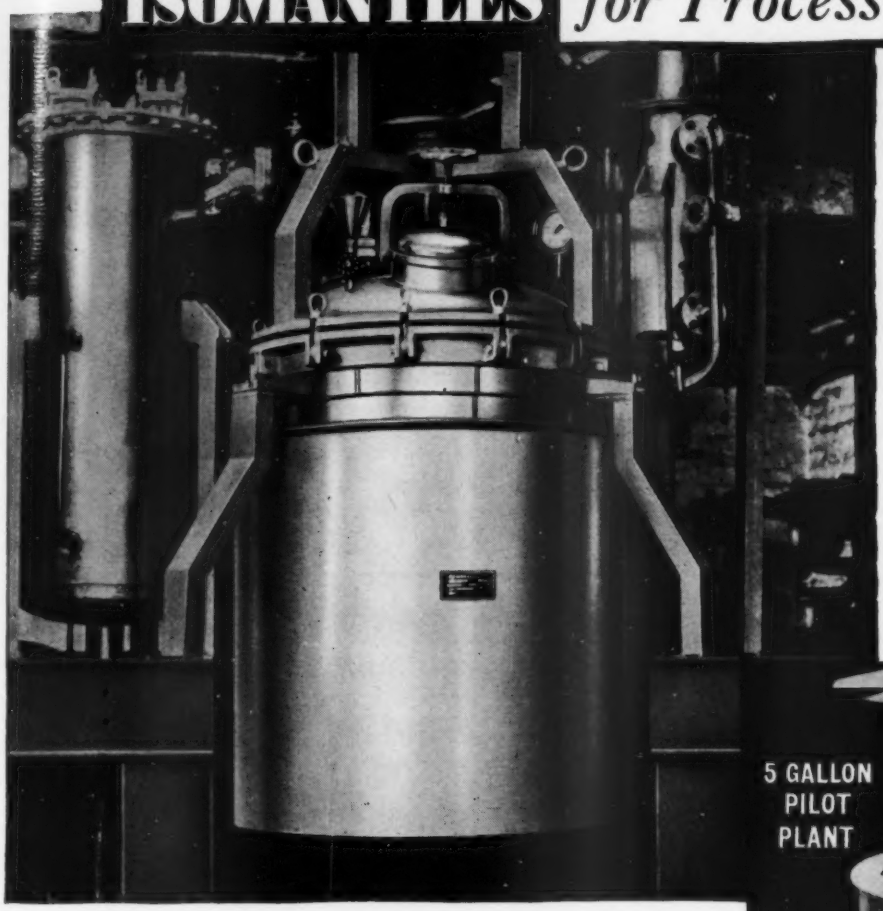

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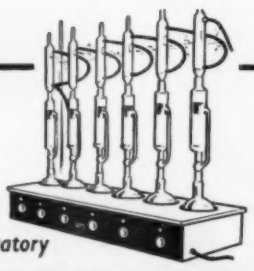
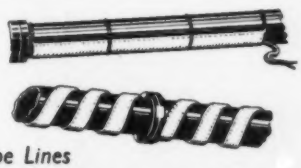


Laboratory

Pilot Plant



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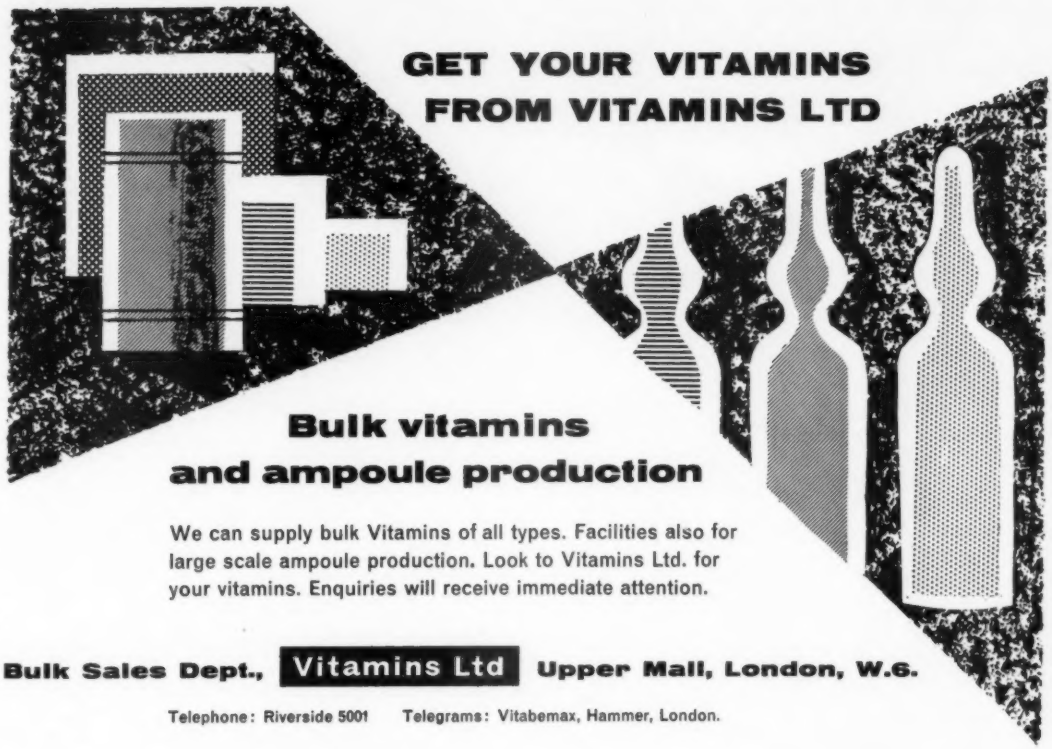

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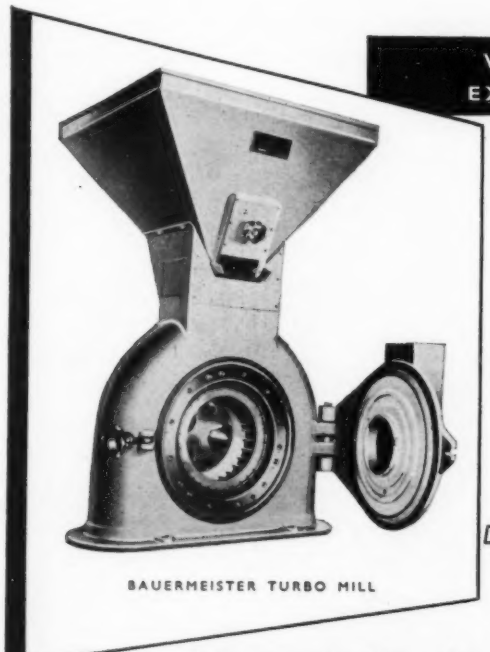

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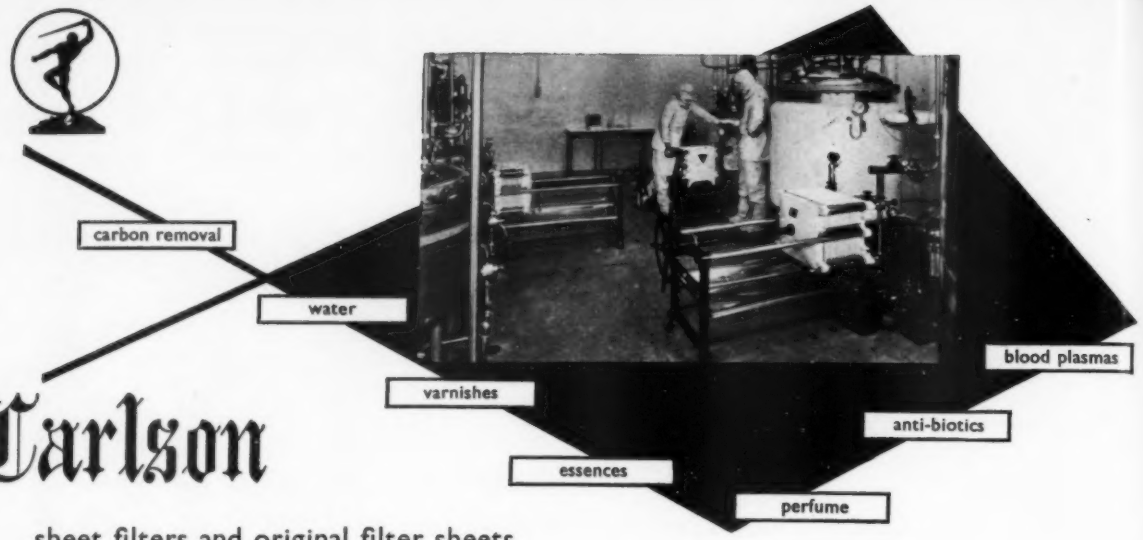

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Two-piece suit designed for wear in sterilized areas and dust free rooms. Can be supplied with elastic at wrist and ankles or with separate over-boots. A skull cap completes the outfit which is minimum lint shedding.

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An attractive protective cap with back elastic and self material or net crown.

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Send now for our brochure detailing the wide range of overalls and headwear available. This is the most comprehensive protective clothing catalogue issued to date and has been compiled to enable the customers to select their special requirements with ease.

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WB OVERALLS

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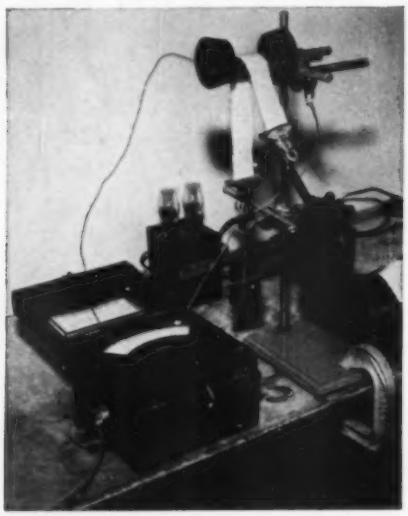
THE INSIDE STORY . . .

2 testing anti-static agents



The above apparatus was developed by our American associates, the Atlas Powder Company, to provide a rapid and dependable method of testing anti-static agents for use on various fabrics.

The basic components of the apparatus shown are:

1. A constant speed motor with an attached reciprocating rod operating at 100 cpm. 2. An insulated bar assembly over which a strip of the test material is moved back and forth under tension. 3. An electro-static voltmeter connected to the bar assembly upon which the voltage developed by friction is recorded.

The voltage generated is directly related to the efficacy of the anti-static agent with which the test strip has been treated. Thus, by comparison with untreated test strips, the effectiveness of a series of anti-static agents may rapidly be tested.

For consistent results particular care is necessary both in the preparation of the test strips and in the operation of the equipment. Interested customers are invited to write for a technical bulletin which contains a detailed description of the above apparatus and an outline of a reliable test procedure.

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Various Honeywill-Atlas surface active agents have proved extremely effective as anti-static agents for many fabrics, and if you have a problem of this type our technical service laboratory is at your disposal. Write at once to the sole selling agents:

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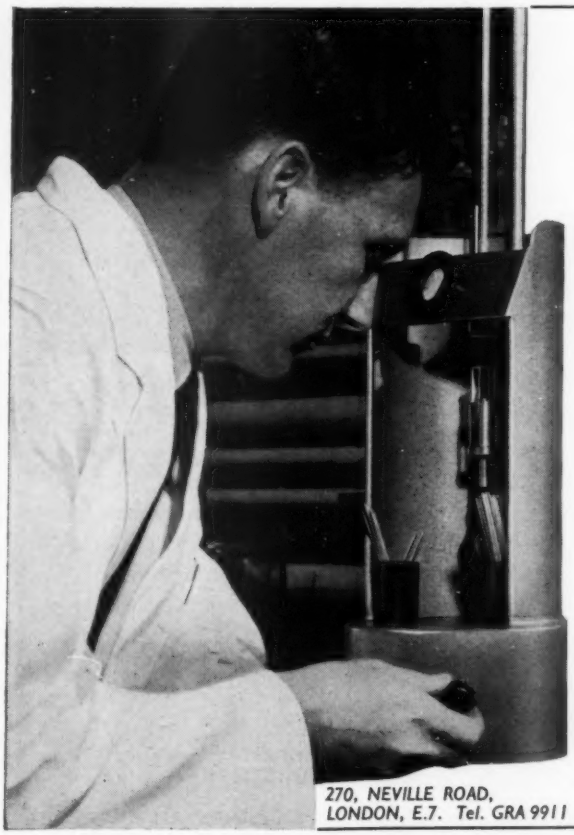

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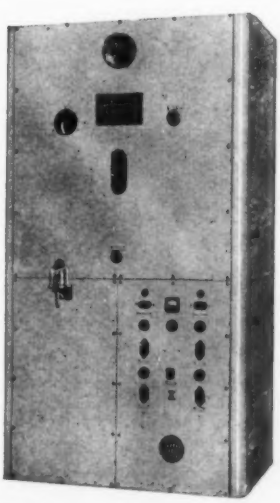

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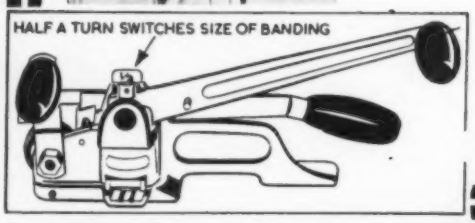

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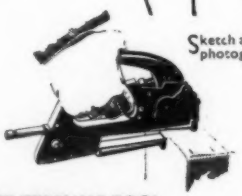
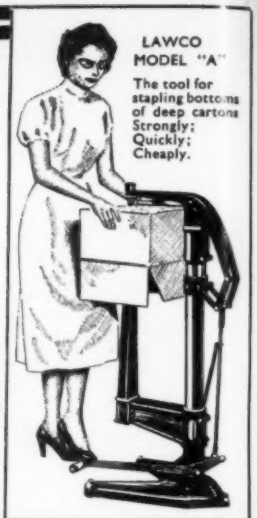


PLIER STAPLING TOOL FIXING LID ON CARTON

Sketch above is genuine from photograph illustrating strength of carton when flats are stapled. Used cartons can be readily repaired and reinforced by stapling with "LAWCO" machines



LAWCO MODEL "A"
The tool for stapling bottoms of deep cartons Strongly; Quickly; Cheaply.

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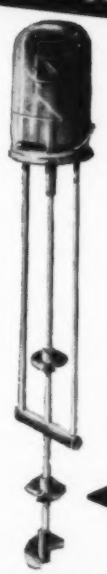

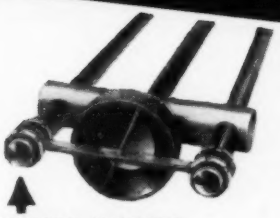

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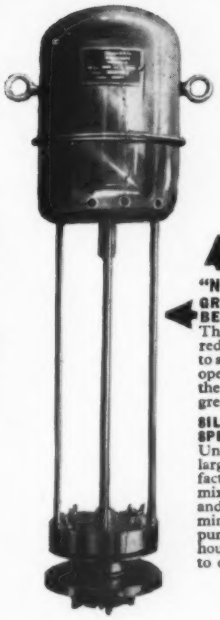

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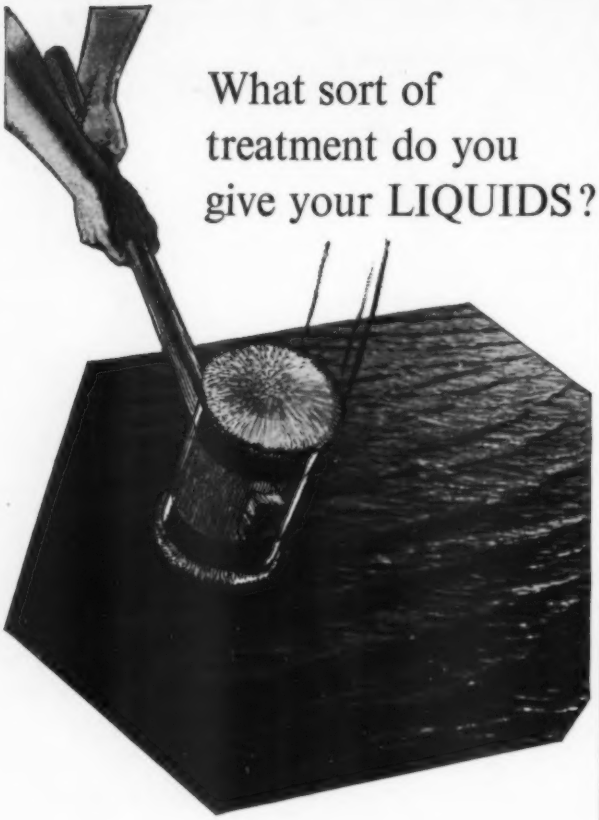

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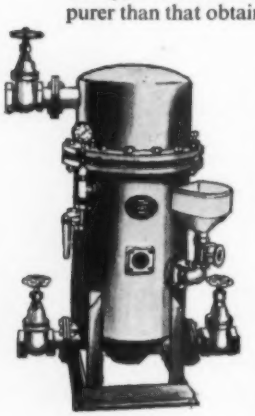

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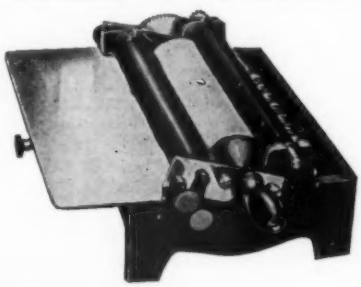

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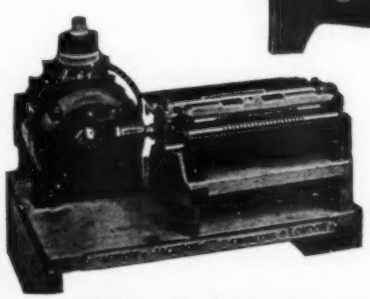

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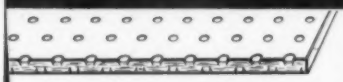

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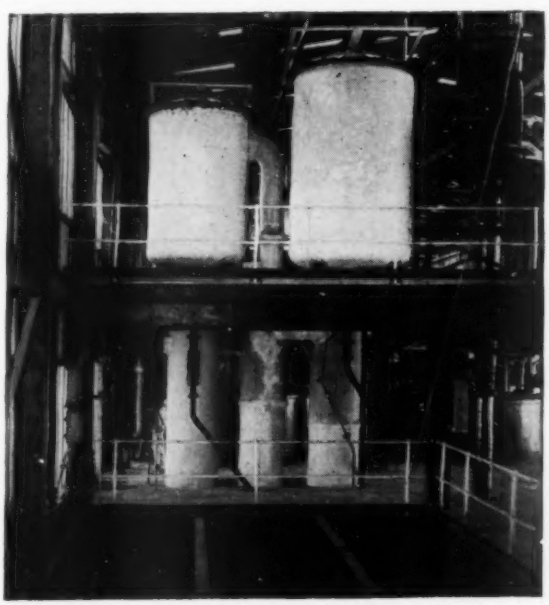

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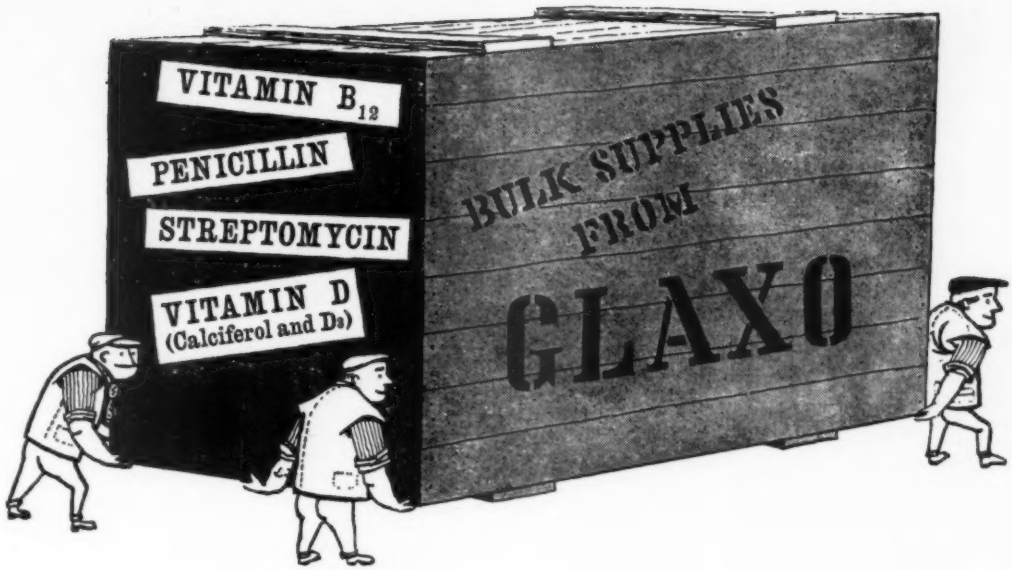

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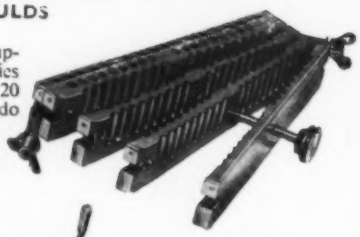

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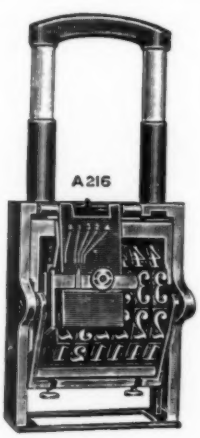

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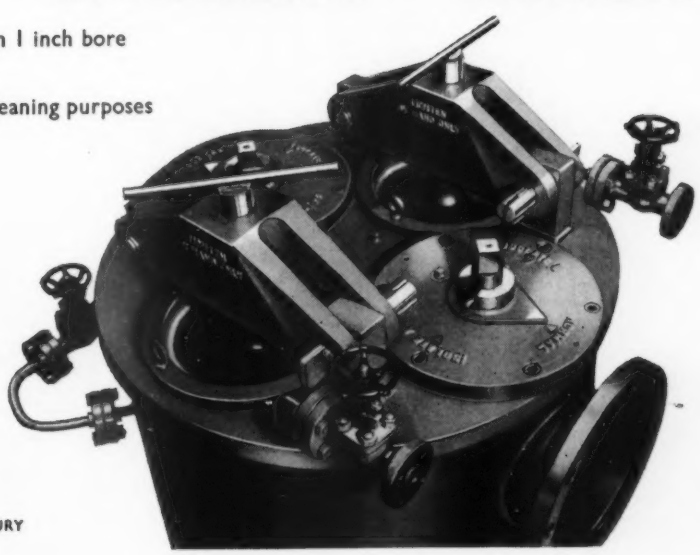

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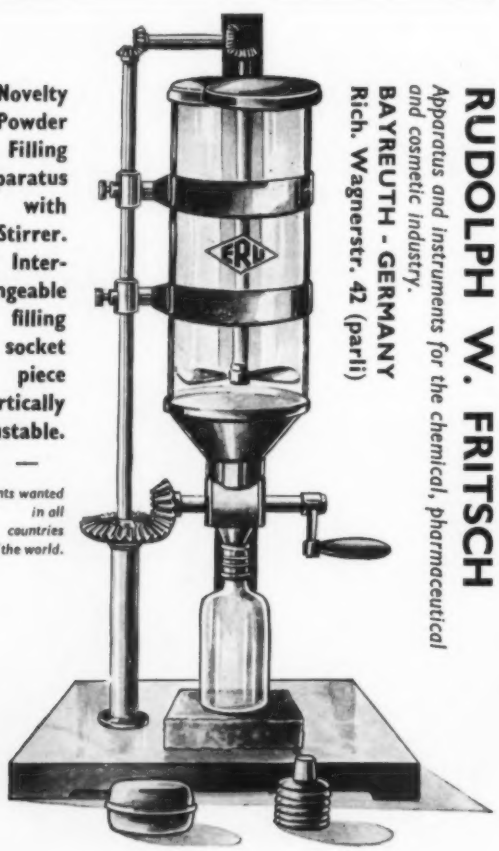

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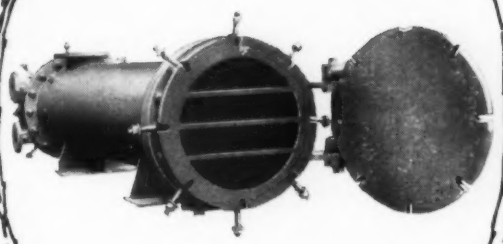

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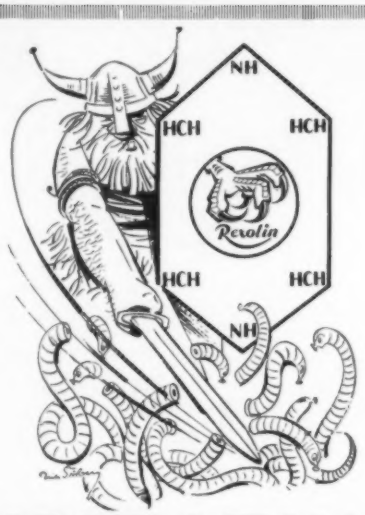

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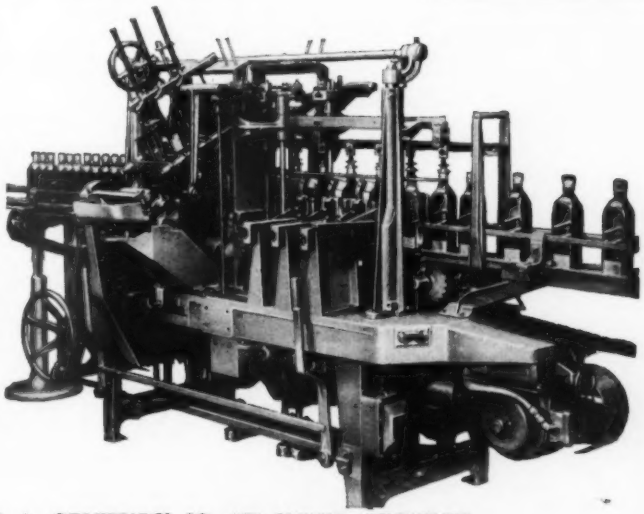

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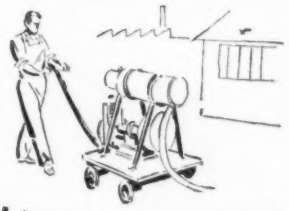

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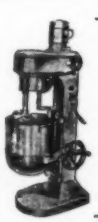

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THE Pyrethrum Board of Kenya requires two Assistant Chemists (preferably female) for analytical control work on their new factory at Nakuru manufacturing pyrethrum extracts. Applicants should have an Inter B.Sc. or the N.H.C. or equivalent and several years experience of organic analytical and industrial process control work. Salary £660 by £20 to £720 per annum. Hard furnished accommodation provided at a rental not exceeding 15% of salary; medical insurance and Provident fund; local and home leave in U.K. Free passages to and from U.K. Nakuru is in the Kenya Highlands and enjoys an excellent, temperate and healthy climate with many local amenities.—Applications to African Pyrethrum Technical Information Centre Ltd., 4, Grafton Street, London, W.1.

LABORATORY Furnishers require Manager for New Branch. Must be young, energetic and have scientific experience. A car will be provided and a Pension Scheme is in operation. This is a position for a man with drive, and salary, etc., will be in keeping.—Box 2867B, *Manufacturing Chemist*, Leonard Hill House, 9, Eden Street, London, N.W.1.

ASSISTANT to Works Director. Young man, preferably with technical background, required to act as assistant to Works Director of a fine chemical and pharmaceutical manufacturing company. The man selected will, after a period of training, be expected to asume full responsibility for production control and purchasing.—Apply, giving full particulars of education, qualification and experience, to Personnel Officer, British Schering Manufacturing Laboratories Ltd., Hazel Grove, Cheshire.

IMPORTANT Spanish firm seeks Chemist with good technical qualification and practical experience in the manufacture of natural and synthetic essences and flavourings for Food Products. Stable situation. Absolute reserve granted.—Write with full particulars to Box 2856B, *Manufacturing Chemist*, Leonard Hill House, 9, Eden Street, London, N.W.1.

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An American Manufacturer has a position open for a man with experience in the production of Plaster-of-Paris bandages and similar lines, to take charge of production in American factory. As residence in United States is necessary, passage and moving expenses will be paid. Applications for this appointment, which will be treated in the strictest confidence, should give details of age and experience, and an outline of career to date. Box 2871B, *Manufacturing Chemist*, Leonard Hill House, 9, Eden Street, London, N.W.1.

BRITISH Cosmetic House requires Manufacturing Chemist for their South African branch in Johannesburg. Appointment to commence January 1959. Salary £1,200 p.a. Age limit 45.—Please write giving full details to Box 2873B, *Manufacturing Chemist*, Leonard Hill House, 9, Eden Street, London, N.W.1.

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Continued in next column

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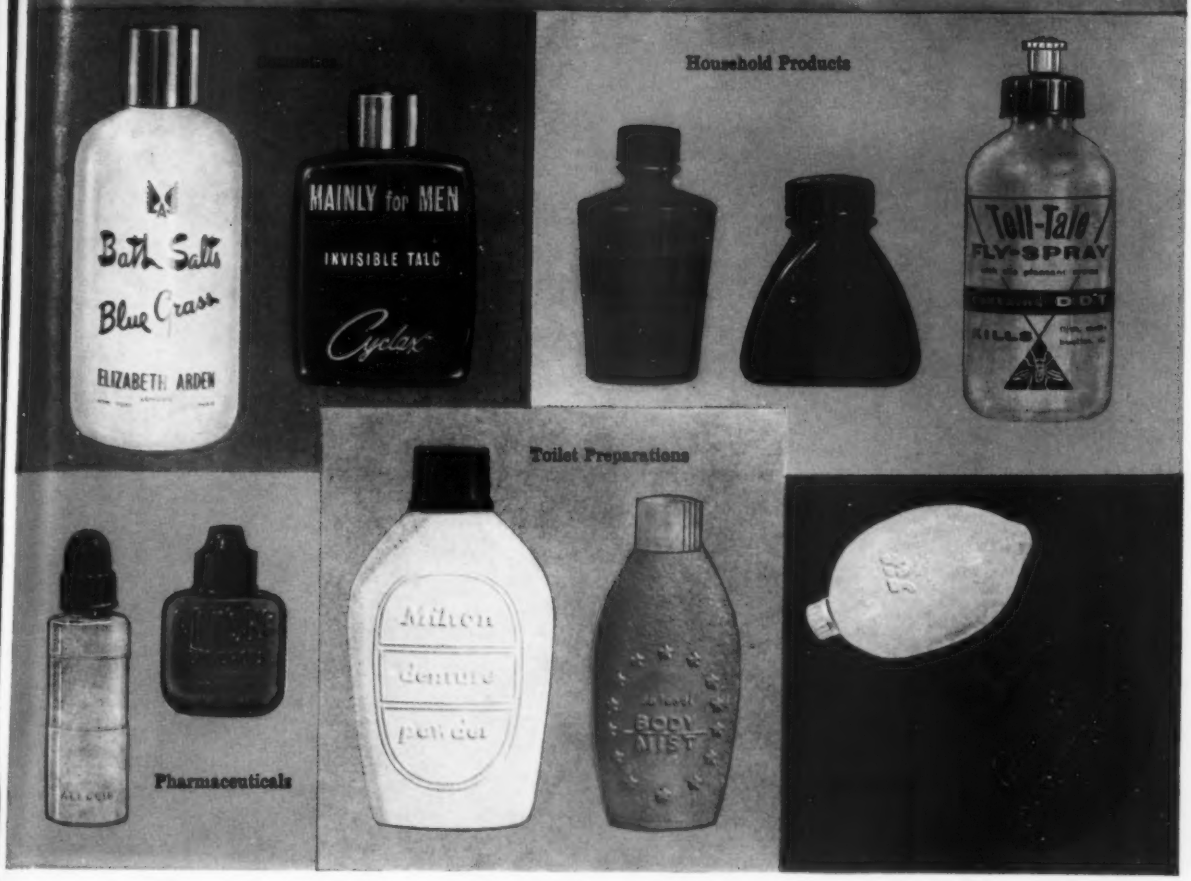

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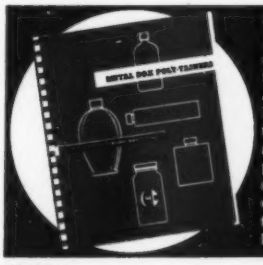

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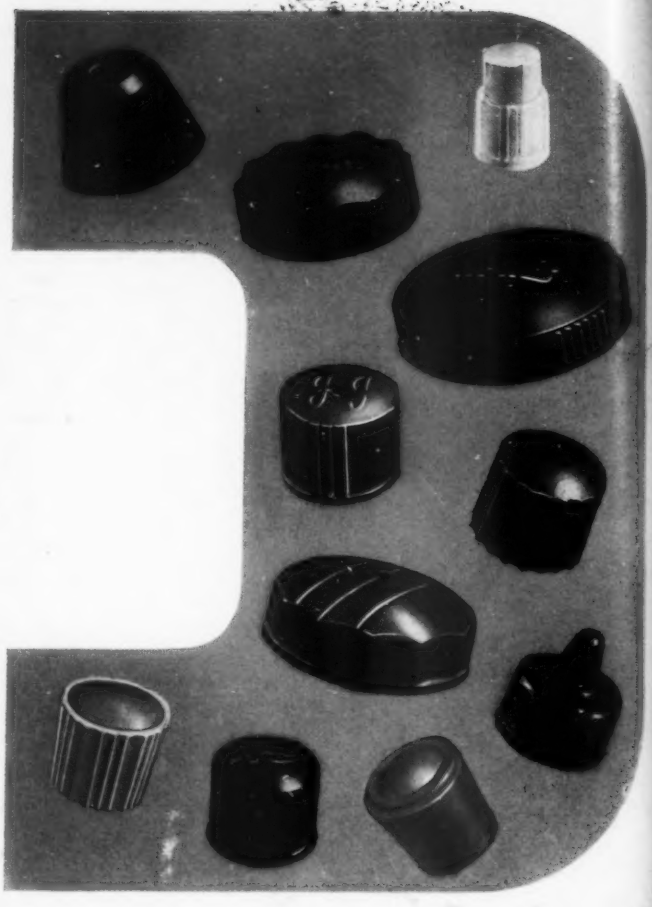

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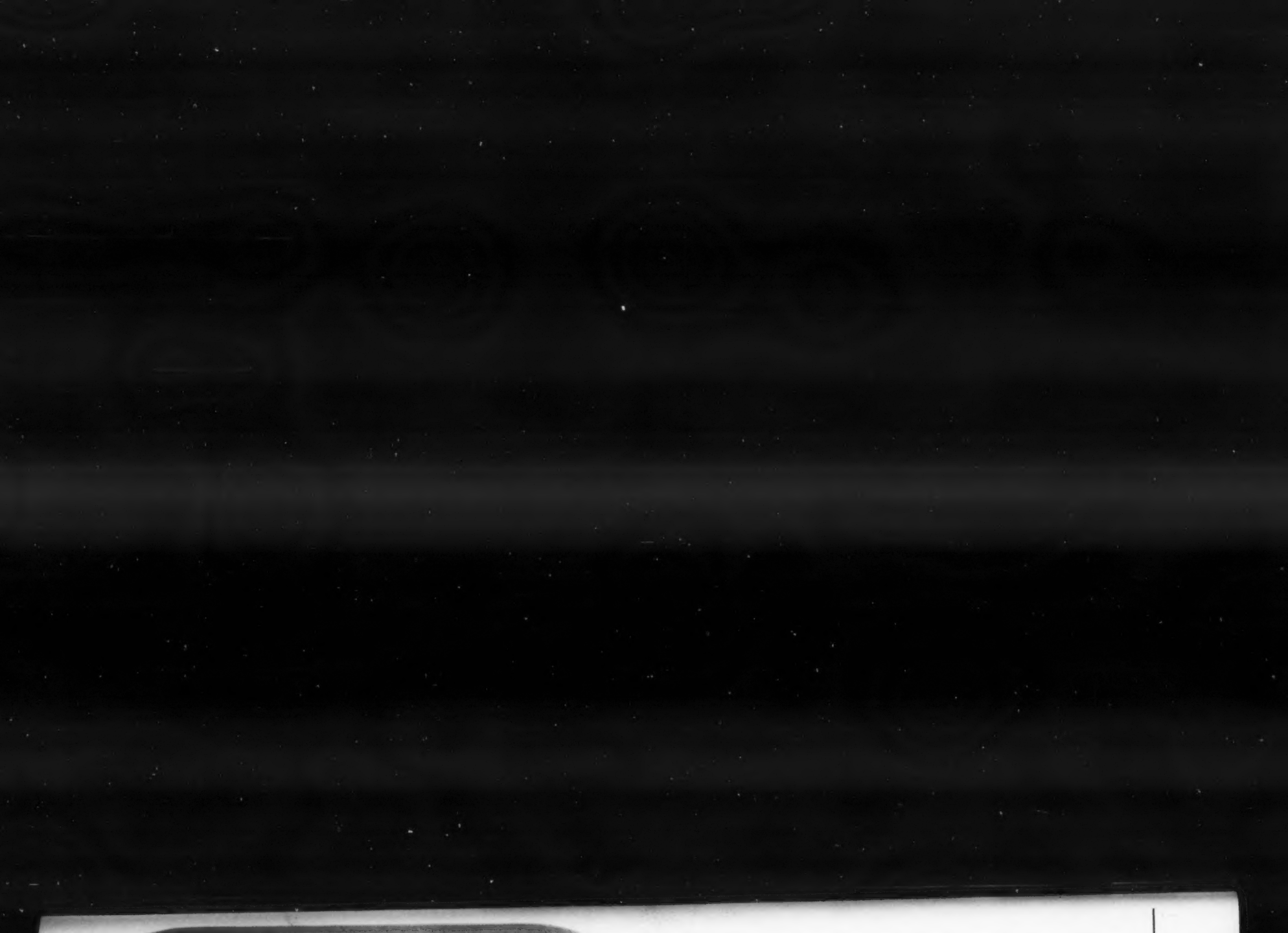
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